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A MECHANICAL ACCOUNT OF THE Non-Naturals:

Being a Brief
EXPLICATION
Of the Changes made in
Humane Bodies,
BY
AIR, DIET, &c.

TOGETHER,
With an Enquiry into the Nature and Uſe
of BATHS upon the ſame Principles.

To which is prefix'd,
The Doctrine of ANIMAL SECRETION
in ſeveral Propoſitions.

By JER. WAINEWRIGHT, M. D.

The FIFTH EDITION, Revis'd.

To which is added,
An Anatomical Treatiſe of the Liver, with
the Diſeaſes Incident to it.

LONDON:
Printed for JOHN CLARKE, under the *Royal Exchange, Cornhill.* 1737.

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THE

PREFACE.

TO attempt any Thing for the Improvement of uſeful Arts, eſpecially that of Medicine, *which is of the greateſt Benefit to Mankind, is a Debt that every capable Perſon owes to the Publick; all Civil Societies having a Right to the Property of private Perſons for the Common Good.*

Whether the following Papers are like to anſwer that End, I leave to the Cenſure of capable Judges; for it is not every Pretender to Medicine, of how great Repute ſoever, that is a competent Judge of ſome demonſtrated Truths. And tho' I do not confine myſelf to Geometrical Reaſonings, yet I'm ſure that he who underſtands not ſomething of Euclid, *is unfit to paſs his Cenſure upon this Undertaking. I do not ſay that the Practice of Phyſick ever will be much leſs than it now is, the Object of* Mathematical *Certainty: But this I dare aſſert, That what Improvements there have been, or are likely to be made in the Theory of* Medicine, *are only under the Conduct of* Arithmetick *and* Geometry.

The Preface.

A Humane Body is a curious Machine, *and ſo far exceeds the Workmanſhip of the moſt Nice and Skilful Artificer, as Divine Wiſdom ſurpaſſes the Underſtanding of a finite Mind; but yet it is ſubject to the ſame Laws of Motion, by which the infinitely Wiſe God governs the Univerſe. 'Tis compos'd of* Solids *and* Fluids, *both govern'd by the Laws of* Gravitation, Impulſe *and* Re-action, *and what Changes are brought about in the* Animal Oeconomy *by the Motion of Matter, under the Conduct of theſe Laws, can no Way be eſtimated without ſome Aſſiſtance from the* Mathematicks.

It is a Maxim univerſally receiv'd among Phyſicians, that Medicine *ſhould begin were Philoſophy ends; and 'tis undoubtedly a neceſſary Qualification in a Phyſician, to be a good Philoſopher; but all the Philoſophy that has yet appear'd in the World, is no better than Trifling Romance, except what hath been writ by the famous Sir* Iſaac Newton, *and ſome few others, who have built their Philoſophical Reaſonings upon* Mathematical *Principles. The wonderful Diſcoveries this Great Man has made by* Geometrical *Reaſonings on Matters of Fact, are truly ſurprizing, and I queſtion not but if the like*

Method were made Uſe of for ſearching into the Cauſes of Diſeaſes, and the Nature of Medicines by as good a Head, that a ſhort Time would diſcover ſomething as remarkable in our Little World, as that illuſtrious Author has done in the Great.

We have ſome Earneſts of what we may expect in this Way, from the Writings of Borelli *and* Bellini, *and in our own Iſland the Learned* Pitcarne, Mead, Cheyne, *and ſome few others, who have made greater Diſcoveries in the* Animal Oeconomy, *than many Ages before can boaſt of. The Method theſe Gentlemen begun, I have purſu'd; and if what I've writ be of any Uſe to the Publick, 'tis a Recompence for my Labour; if not, I cannot help it, I am not the firſt that has been miſtaken in his own Performances.*

I have prefix'd, to the Book ſome Propoſitions concerning Animal Secretion, *not only to ſave myſelf the Labour of frequent Repetitions, (having Occaſion to refer to 'em ſo often) but becauſe little or nothing has been ſaid to the Purpoſe by any, on this Subject, except what we have in ſome of the forementioned Authors. Beſides, there is no Part of the Art better deſerves our Enquiry into, than the Doctrine of*

Secretion, *ſince there are but few Diſtempers, which admit of a Cure without increaſing or leſſening ſome Evacuation.*

To the Chapter of Air, *I have ſubjoin'd ſome Thoughts of the Operation of the* Bath, *whether* Temperate *or* Cold, *upon a humane Body, and have accounted for the Effects of* Bathing, *from either the* Weight *and* Cold, *or the* Warmth *and* Moiſture *of* Bath-*Waters. I have alſo calculated the Weight of Water we ſuſtain in* Bathing, *and demonſtrated, that the conſtant Expulſion of perſpirable Matter, thro' the Pores of the Skin, is not ſufficient to reſiſt the Entrance of Water into the Body, when we bathe; and alſo ſhew'd how the Wearing of Flannel becomes prejudicial to weak People.*

The other Parts of my Diſcourſe fall naturally under their proper Heads. As to the Style, though it be rough, yet, if 'tis but intelligible, 'twill be enough for my Purpoſe. I muſt confeſs the Uncorrectneſs of the whole Work, which had yet been more ſo, had it not been for the Inſpection of my ingenious Friend, Dr. Coats: *But be it as it will, I'm ſure it was deſign'd well, and may, if read without Prejudice, anſwer its Deſign, at leaſt ſo far, as to excite a better Hand to correct its Errors, and ſupply its Defects.*

Of Animal Secretion.

PROP. I.

A *Fluid* muſt have its compounding Parts ſmall, ſpherical, or approaching thereto, ſmooth, or ſuch as can ſlide eaſily one over another, and if *Homogeneous*, the Parts muſt be of equal Denſity, by the 147th Propoſition of *Borelli*, *De Motibus Naturalibus a Gravitate factis.*

PROP. II.

Fluids preſs *Undiquaque*, and the Direction of their Preſſure is in every Point perpendicular to the Sides of the containing Veſſel, and therefore *Secretion* is perform'd by a Compoſition of two Motions, one direct, and the other tranſverſe.

PROP. III.

A *Heterogeneous Fluid* at Reſt in the Body, and equally preſs'd, the moſt liquid Part is forc'd out firſt.

PROP. IV.

A *Heterogeneous Fluid*, ſuch as the Blood, whoſe compounding Parts are of different Denſities, upon its Stagnation will percipitate its heavy, and elevate its light Parts, and they all in Time will take their Places according to their Specifick Gravities, and where the *Fluid* does not Stagnate, the Separation of the heavy Parts from the Light, will be in Proportion to the Slowneſs of the Motion of the *Fluid*.

PROP. V.

The red Fibrous Part of the Blood, upon its Stagnation, retires into the Center, and forces the *Serum* to the Sides of the containing Veſſel.

COROL.

The ſlower the Blood's Motion is, the more *Serum* is ſeparated.

PROP. VI.

Fluids reſiſt the Motion of ſuch Bodies moſt, whoſe Surfaces are greateſt, in Proportion to their Solidities, or in other Words, whoſe Specifick Gravities are the leaſt.

PROP. VII.

The moſt viſcid Parts of the *Serum* are lighteſt, *viz.* ſuch as are ſeparated in the Glands of the *Noſe*, *Mouth*, *Palate*, *Windpipe*, *Stomach*, *Guts*, &c. being theſe ſwim in Water, which is lighter than *Serum.*

COROL. *to the two laſt* PROP.

The moſt viſcid Part of the *Serum* of the Blood is the leaſt ſuſceptible of Motion, or moved with the greateſt Difficulty through the Arteries.

PROP. VIII.

A *Fluid* forc'd thro' a Concave Cylinder, moves with greater Celerity at the *Axis*, than at the Sides, (*by the* 215*th Prop.* of *Borelli*, *De mot. natural. a gravitate fact.*) and much more ſo through a Concave Cone.

PROP. IX.

(*a*) *Baglivi* hath obſerv'd the Motion of the Blood ſwifteſt in the Middle of

---

(*a*) De Praxi Medica, *p.* 398.

the Artery of a *Frog*, and therefore the moſt light Parts being leſs ſuſceptible of Motion, will be forced to the Sides of the Arteries where there is the leaſt Motion, ſo that where there is the leaſt Motion, there will the lighteſt (being the moſt Viſcid) (*by the 7th Prop.*) Part of the *Serum* be ſeparated.

COROL.

The Viſcidity of the ſeparated *Fluid* will be reciprocally, as the Celerity of the Blood at the Orifice of the ſeparating Canal.

COROL. II.

The Velocity of the Blood at the Orifice of the ſeparating Canal, being as the Number of Plications in the complicated Artery; (by the 40th *Prop.* of *Bellini de motu Cordis*) therefore the Viſcidity of the ſecerned Matter, will be as the Number of Plications in the complicated Artery.

PROP. X.

When the Motion of the Blood is too ſlow, the moſt ſerous Part of the Blood is thrown upon theſe Arteries, which are the ſmalleſt, moſt complicated, or at the greateſt Diſtance from the Heart. For the Motion of the Blood being too ſlow, more of the red Part of it will move along the *Axis* of the Artery, than before (*by the 5th Prop.*) therefore the red Part will move with much greater Celerity than the *Serum*, (*by the 8th and 9th Prop.*) and, conſequently, thro' ſuch Arteries where there is the leaſt Reſiſtance, *viz.* thro' the wideſt, the leaſt complicated, and thoſe neareſt the Heart; for which Reaſon, the Serum will be forced upon ſuch Arteries as are the ſmalleſt, moſt complicated, or at greateſt Diſtance from the Heart.

PROP. XI.

A *Gland* is a complicated Artery (over whoſe outward Coat, as in all the Arteries and Veins, are Branches and Nerves to ſerve their ſpiral Contortion) which ſends excretory Veſſels out of its Sides, after which it degenerates into a Vein. This is Dr. *Cheyne*'s *1ſt Prop.*

PROP. XII.

The *Inteſtines* are a Gland, and the *Lacteals* are the ſecretory Veſſels. This is Dr. *Cheyne*'s *4th Prop.*

PROP. XIII.

The Orifices of the Excretory Veſſels of every Gland are circular, being all the Veſſels in which the Fluids of the Body move, are either Concave Cylinders, or Cones; for the Preſſure of a Fluid being always perpendicular to the Sides of the containing Veſſel, and being at equal Diſtances from the Center, the Sides muſt be every where equally diſtracted, *viz.* a Section perpendicular to the *Axis* of the Veſſel, muſt be a Circle, and conſequently the Veſſel be either *cylindrical*, or *conical.* This *Prop.* is more fully demonſtrated in Dr. *Pitcarne's* *Diſſertation. de Circulatione Sanguinis*, &c.

COROL.

The Orifices of the excretory Veſſels of different Glands, differing only in their Magnitude, the Fluids ſeparated in different Glands, will differ only in Degrees of *Coheſion* and *Fluidity*.

COROL. II.

Any peccant Matter in the Blood may be evacuated by any of the Glands, provided their Orifices be but ſufficiently inlarged.

COROL. III.

The increaſing of one Evacuation will leſſen another, and *Vice verſa.*

PROP. XIV.

All the *conglomerate Glands* have Coats made of muſcular Fibres, with which they force out their Contents by Contraction, and the more in Quantity, or the more forcibly any ſecern'd Matter is to be expell'd, the ſtronger are the muſcular Fibres.

PROP. XV.

The relaxed Coat of any Gland increaſes the Viſcidity of the ſecerned Matter, and *Vice verſa*; for the ſecerned Matter will grow much more viſcid by ſtaying longer in the Gland, the thin Parts being evaporated by the Heat of the Body, the reſt will be more viſcid.

COROL.

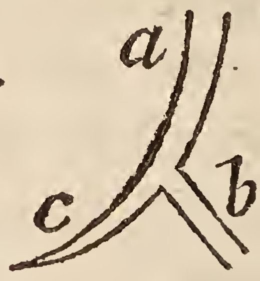
Opiates, *Drunkenneſs*, and whatever makes an univerſal Relaxation, increaſe the Viſcidity of the Matter ſeparated in all the *conglomerated Glands*.

PROP. XVI.

Such Glands, whoſe compounding Arteries are moſt complicated, ſecerne the moſt viſcid Matter from the Blood.

Demonſtration.

Let there be a branched Canal of the annex'd Figure, and let the Extremity of one of the Branches *c* be ſhut up, and the other Branch *b* be open, then, by an Engine force thro' the Trunk *a*, any Kind of viſcid Liquor, ſuch as the Blood, or whoſe compounding Parts are ſome more, and ſome leſs fluxil, and it will equally run into both the Branches, till the Branch *c* be full, but after that, what ſhou'd move through *c*, muſt paſs thro' *b*, ſo that the whole Liquor, that paſſes thro' the Trunk *a*, muſt likewiſe, in the ſame Time, paſs thro' the Branch *b*; now *b* being much ſtraiter than *a*, the Liquor



Liquor muſt paſs with greater Celerity through *b* than *a*, (*by the third Corollary of the* 10*th Theorem of Mr.* Keill's *Lectiones Phyſicæ.*)

So that ſuch Parts of the Liquor, as are moſt eaſily moved, will firſt paſs the Branch *b*, and the Parts that are leaſt ſuſceptible of Motion, or, in other Words, thoſe which are moſt viſcid, will be ſoliciting their Entrance into the Branch *c*; but this viſcid Matter cannot enter without forcing ſome of the moſt moveable or fluid Part, of what is contain'd in *c*, into *b*, ſo that *c* will conſtantly fill with viſcid Matter, till it can hold no more. If therefore the Extremity of the Branch of any Artery be totally obſtructed, it is hereby diſpoſed to fill with the moſt viſcid Matter the Blood can ſupply, and that for this Reaſon, *viz.* becauſe the progreſſive Motion of the Blood thro' that Branch muſt ceaſe, and in ſuch Branches of any Artery, where the Motion of the Blood is moſt retarded, thro' that Branch will the moſt viſcid Part of the Blood paſs, as the moſt fluid will in thoſe Branches, where there is the leaſt Reſiſtance to the Motion of the Blood. Now, in every complicated Artery, the Reſiſtance being greater than in a ſtrait one, the Motion of the Blood will be ſlower, and that in Proportion to the Number of Plications in the complicated Artery; therefore, in the Arteries which are moſt complicated, the Motion of the Blood in 'em being the ſloweſt, its Viſcidity will be the greateſt, and therefore ſuch Glands, whoſe compounding Arteries are moſt complicated, ſecerne the moſt viſcid Matter from the Blood, Q. E. D.

PROP. XVII.

The Quantity of fluid Matter ſeparated in any Gland, is in compound Proportion of the Quantity of Blood, its Celerity at the Orifices of the excretory Veſſels, the Wideneſs of the Orifices of theſe Veſſels directly, and the Viſcidity of the Blood reciprocally.

Demonſtration.

The Celerity of the Blood's Motion, the Wideneſs of the Orifices, and the Viſcidity of the Blood, being given, the Quantity ſeparated muſt be as the Quantity of Blood directly; for a greater Quantity ſeparates more, and a leſs Quantity ſeparates leſs.

The Quantity of Blood, its Viſcidity, and the Wideneſs of the Orifices being given, the Quantity ſeparated, will be, directly, as the Celerity; for a greater Celerity gives a greater Quantity, and a leſs Celerity, a leſs.

The Quantity of Blood, its Celerity and Viſcidity being given, the Quantity ſeparated will be directly as the Wideneſs of the Orifices; for the wider the Orifices, the more will be ſeparated, and the ſtraiter the leſs.

The Quantity and Celerity of the Blood, and the Wideneſs of the Orifices being given, the Quantity ſeparated, will be reciprocally as the Viſcidity of the Blood; for the greater the Viſcidity, the leſs will be ſeparated, and the leſs the Viſcidity the more; therefore none of theſe being given, the Quantity ſeparated will be as the Quantity of Blood, *&c.* Q. E. D.

PROP. XVIII.

An increaſed Quantity of Blood, increaſes the fluid Secretions, in a Proportion greater than the viſcid.

Demonſtration.

The Quantity of Blood being increaſed, the Diameter of all the Veſſels will be inlarged, but in different Proportions; for the ſame Force being the increaſed Quantity of Blood applied to the leſs complicated Arteries, will diſtract them, or inlarge their Diameters more than it will the more complicated, being the Reſiſtance in theſe is greater than in thoſe, and that in Proportion to the Number of the Plications, one Artery hath more than another; now the Quantity of ſeparated Matter being, *Cæteris paribus*, as the Wideneſs of the ſeparating Canal, (*by the laſt Prop.*) the Quantity ſeparated in the leſs complicated Artery, whoſe Diameter is more inlarged in this Caſe, will be greater than what is ſeparated in a more complicated Artery, and ſeeing ſuch Glands whoſe compounding Arteries are moſt complicated, ſecern the moſt viſcid Matter from the Blood, and the leaſt complicated the moſt fluid (*by the* 16*th Prop.*): Therefore an increaſed Quantity of Blood, by increaſing the Diameter of the leſs complicated Arteries, more than of the more complicated, increaſes the fluid Secretions more than the viſcid, Q. E. D.

PROP. XIX.

A decreaſed Quantity of Blood leſſens the fluid Secretions more than the viſcid: This needs no Proof, being the Reverſe of the laſt Propoſition.

PROP. XX.

An increaſed Celerity of the Blood's Motion, increaſes the fluid Secretions more than the viſcid, and *Vice Verſa.* A decreaſed Celerity leſſens the fluid Secretions more than the viſcid.

Demonſtration.

The Celerity of the Blood's Motion being greater, the *Impetus*, by which the Arteries are diſtracted, or their Diameters inlarged, will be greater, and ſo exert its Force more upon the leſs complicated Arteries, than upon ſuch as are more complicated, and conſequently promote the fluid more than the viſcid Secretions, (for the Reaſons given in the Demonſtration of the 18th *Prop.*) and becauſe an increaſed Celerity will, by breaking the Blood into ſmall Parts, render it more fluxil, and thereby ſupply a greater Quantity of ſuch Particles, as will paſs the Glands, whoſe Diameters are the leaſt; therefore, upon this Account alſo, an increaſed Celerity of the Blood's Motion, will increaſe the fluid Secretions more than the viſcid, Q. E. D.

PROP. XXI.

An univerſal Inlargement of the Orifices of all the Glands, increaſes the fluid Secretions more than the viſcid, and *Vice Verſa*, an univerſal Contraction leſſens the fluid Secretions more than the viſcid.

Demonſtration.

The Diameters of the ſmalleſt Orifices being inlarged, are big enough to ſecern the viſcid as well as the fluid Matter; and becauſe the Matter ſecerned in different Glands, differ only in Degrees of *Cohesion* and *Fluidity* (*by the 1ſt Corollary of the 13th Prop.*) therefore the Orifices of the ſmall Glands being inlarged, the more viſcid Matter, that uſed to be ſeparated in other Glands, will be ſeparated in theſe; and therefore leſs will be ſeparated in theſe Glands that are fitted for viſcid Secretions, and more in thoſe fitted for the Fluid. Therefore an univerſal Inlargement of the Orifices of all the Glands, increaſes fluid Secretions more than viſcid, Q. E. D.

PROP. XXII.

An increaſed Viſcidity of the Blood decreaſeth the fluid Secretions more than the viſcid, and *Vice Verſa*. An increaſed Fluidity increaſeth the fluid Secretions more than the viſcid.

Demonſtration.

A decreaſed Celerity of the Blood's Motion leſſens the fluid Secretions more than the viſcid, (*by the 20th Prop.*) but the Celerity decreaſeth as the Reſiſtance increaſeth; now the Reſiſtance is greater when the Blood is moſt viſcid, being it paſſes with greateſt Difficulty thro' the capillary Arteries; therefore an increaſed Viſcidity, by leſſening the Celerity, decreaſeth the fluid Secretions more than the viſcid. Q. E D.

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The Introduction.

THAT I may treat more methodically of the Advantages to be reaped by a regular Uſe of the Non-Naturals, both with Reſpect to the Preſervation of Health, and the Cure of Diſtempers, I ſhall explain ſome of the moſt obvious Phænomena in Diſeaſes both Chronical and Acute, that it may appear, how well adapted they (the Non-Naturals) are, by a judicious Application, not only to confirm our Health, but reſtore it: And that, in many Caſes, they will prove more efficacious than the moſt celebrated Drug. We have Inſtances more than enow of ſuch as, by Change of Air, or a luxurious Diet for one more temperate, (which was Cornaro's Caſe) or fleſh Meat for Milk and Vegetables; or of ſuch, who have taken long Journies, or made long Voyages, or, by ſpontaneous Vomiting, Purging or Sweating, have been cured of ſuch Diſtempers,

pers, as would not yield to any Medicine, tho' never ſo generous.

The Method I ſhall purſue, will be, firſt, to account for ſome general Diſorders in the Stomach; *then to give a ſhort* Hiſtory *and* Theory *of three remarkable chronical Diſtempers,* viz. *the* Aſthma, Conſumption, *and* Dropſy; *and, after that, to explain ſome of the moſt notorious Symptoms in* acute *Diſtempers, eſpecially in* Fevers: *With ſome ſhort Hints towards eſtabliſhing a better Method for the Cure of 'em, than what is followed by the Generality of* Phyſicians.

A
Mechanical Account
OF THE
Non-Naturals, &c.

CHAP. I.

Of the Stomach, and its Diſorders.

§ 1. 'TIS well known that the *Stomach* is deſign'd and fitted for the Digeſtion of our Meat, by which it is divided into ſuch ſmall Parcels as will paſs thro' the *Lacteals*, into the Maſs of Blood, for our Strength and Nouriſhment. 'Tis made up of *Membranous* and *Muſcular Fibres*, fill'd with Arteries, Veins, Nerves, and Glands, by which a *Viſcid* Matter is

ſepa-

ſeparated from the Blood, and pour'd into its Cavity, for very good Ends and Purpoſes.

§ 2. This, if increaſed, or diminiſh'd, either in its Quantity or Viſcidity, gives riſe to many Diſorders in the Stomach, as Loſs of *Appetite*, *Nauſea's*, *Vomiting*, eſpecially in the Morning, which is common to hard Drinkers, *Diſtention* of the *Stomach* after Eating, *&c.*

§ 3. The *Stomach*, by the help of its Muſcular Fibres, together with the *Diaphragm* and *Muſcles* of the *Abdomen*, is enabled ſo to *toſs* the Meat about, that if that Motion be not the ſole, (according to the Learned (*a*) Dr. *Pitcarne*,) yet 'tis certainly the principal Cauſe of *Digeſtion*. The Force of the Muſcles imploy'd in this Buſineſs, is almoſt incredible; for if the comparative Force of the Muſcles be as their *Solidities* or *Gravities*, as he hath demonſtrated; and the Force of the *Flexor Policis* be equal to 3720 Pound weight, according to the Calculation of (*b*) *Borelli*; how great then muſt be the Force of all thoſe

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(*a*) Diſſertatio de Motu quo Cibi in ventriculo rediguntur ad formam ſanguini reficiendo idoneam.

(*b*) De Motu Animalium, *Par.* 1. *p.* 126.

Muſcles taken together? * And indeed nothing elſe being neceſſary in the Buſineſs of *Digeſtion*, but that the Parts of our Food be ſo divided, that their greateſt *Diameters* be leſs than the Orifices of the *Lacteals*; the Strength of theſe Muſcles, ſeems more than ſufficient for that Work. However, be this as it will, every Body will own that the Muſcles have a conſiderable Share in it. Hence it follows, that whatever encreaſeth or leſſeneth Muſcular Motion in general, or the Motion of the recited Muſcles in particular, haſtens or retards *Digeſtion.*

§ 4. An increaſed Quantity of Blood helps our *Digeſtion*; for Dr. *Cheyne* hath demonſtrated in his third *Lemma* in the *New Theory* of *Fevers*, that *Cæteris paribus*, the Strengths of different Animals of the ſame Species, or of the ſame Animal at different Times, are in a triplicate Proportion of the Quantities of the Maſs of their Blood. And the whole Strength of an Animal is the Force of all his Muſcles taken together, therefore, whatever increaſeth the

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* *It is, as the Doctor computes, equal to* 260000 *Pound Weight.*

Strength, increaſeth the Force of all the Muſcles, and of theſe ſerving *Digeſtion*, as well as others. Yet notwithſtanding the Truth of this Lemma, the Quantity of Blood may be encreaſed in ſuch Circumſtances, as to abate the Strength: The Æquilibrium between the Blood and Veſſels being deſtroyed, wonderfully leſſens the Strength, as it is evident from ſeveral Paſſages in *Baglivi de Fibra Motrice.* The ſudden Suppreſſion of Perſpiration, tho' it increaſe the Quantity of the Blood, as it muſt conſiderably, by *Sanctorius*'s Calculation, yet it leſſens the Strength, becauſe the retained Matter being what ought to be evacuated, ſo alters the Texture of the Blood, as to make it unfit for Muſcular Motion. Suppoſe the increaſed Quantity be join'd with an increaſed Viſcidity, the Quantity of ſmall ſeparable Parts decreaſing, as the Viſcidity encreaſeth, the Quantity of *Animal Spirits* ſeparated in the *Brain*, will be leſs, and the Tenſity of the Fibres being in Proportion to the *Animal Spirits* forced into them, they will not be able to *Counterpoiſe* the greater Weight of the Blood, and ſo the Strength will be diminiſh'd.

§ 5. *Bellini*, in his forty-ninth Propoſition *de Motu Cordis*, proves, That if the Blood be ſo Vitiated, as to increaſe or diminiſh Strength, 'tis the ſame as if the Blood was in a natural State, but its Quantity encreaſed or diminiſh'd in the ſame Proportion. So that the Blood when *Vitiated*, may ſo impair the Strength of the Muſcles, as to ſpoil *Digeſtion*, and yet in ſome Caſe the Blood may be ſo *Vitiated* as to increaſe Strength according to the Propoſition, and thereby help *Digeſtion*. Therefore a voracious Appetite and ſtrong Digeſtion are no infallible Signs of a healthful State of the Blood.

We have one Reaſon from what hath been ſaid, why nouriſhing Food in little Quantities, ſo often helps a weak *Digeſtion*; as alſo why *Hectic* People Digeſt their Victuals ſo very ill, the Quantity of their Blood being ſo much diminiſhed as (*c*) Dr. *Cheyne* hath made out beyond Diſpute.

§ 6. *Vomits*, *Bitters*, *Chalybeats*, and *Exerciſe*, eſpecially in cool, dry Air, mightily promote *Digeſtion*, by ſtrengthning the

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(*c*) *New Theory of Fevers*, *p.* 134.

Fibres, whereby Muſcular Motion is increaſed, as well as by leſſening the Quantity of viſcid Matter, ſeparated in the Glands of the Stomach; which *Vomits* do directly, and the other by increaſing Perſpiration, whereby other Evacuations are leſſened, for (*d*) Dr. *Pitcarne* hath proved, that the increaſing of one Evacuation, is the leſſening of another.

Bitters and *Chalybeats* leſſen the Viſcidity of the Blood, and increaſe its Celerity, whereby it is better fitted for the Secretion of perſpirable Matter, and alſo of *Animal Spirits*, which will ſtrengthen the Muſcular Fibres, and ſo help Muſcular Motion, as appears by the twentieth Propoſition of *Animal Secretion.*

How much *Exerciſe* in cool dry Air ſtrengthens the Fibres, and encreaſeth Health, is evident from the 7, 8, and 27 *Aporiſms* of *Sanctorius*, § 3. compared with the 34 and 35 *Aphoriſm*, § 5.

§ 7. It is eaſy to ſhew in other Circumſtances, how neceſſary it is to relax the Fibres of the *Stomach*, when by

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(*d*) Diſſertatio de Circulatione Sanguinis per vaſa minima, *p.* 33.

any Means they are grown too *Springy*. When the Fibres of the *Stomach* are too *Tenſe*, their *Vibrations* are ſmarter, and Senſation thereby more *acute*, ſo that what before was eaſy and delightful to the *Stomach*, is now moſt ungrateful and tormenting. In this Caſe there is often grievous Heat, Pain, Sickneſs and Thirſt, and yet the *Stomach* is not able to bear the ſmootheſt Liquor without *Vomiting*.

Beſides this, the Orifices of the Glands are contracted, and thereby the *Stomach* robb'd of a great Share of that Slime that ſhould defend it; for the Quantity of Secerned Matter, is in a compounded Proportion of the Wideneſs of the Orifice, and Celerity of the Fluid, by the ſeventeenth Propoſition of *Animal Secretion*: And farther, the Secerned Matter is not only leſs in Quantity, but alſo thinner, and the thinner the Fluid is, the fitter it will be to diſſolve the *Acrid Salts* contained in the Blood, which by this Means will be better ſtocked with them, and conſequently become a *Stimulus* itſelf, to ſo ſenſible a Membrane as the *Stomach* is lined with. The Smalneſs of the Secretory Veſſels, is not the only Cauſe why this

Secerned Matter ſhould be more Fluid, but alſo the increaſed Velocity, with which the Blood moves in theſe contracted Veſſels. That the Blood moves more ſwiftly in the contracted Arteries is certain, (from the 3d *Corol.* of the 10th *Theorem* of Mr. *Keil's Lectiones Phyſicæ*) eſpecially if the Contraction be Univerſal, as it will be by Conſent, as is evident from *Bellini de Stimulis*, *Baglivi de Fibra Motice*, and alſo from ſeveral of (*e*) *Sanctorius's Aphoriſms.*

How the Velocity of the Bloods Motion ſhould increaſe the Fluidity of the Secerned Matter, ſeems more difficult to account for, ſince the Blood is ſo much diſpoſed to depoſit its Serum upon its ſlow Motion, as appears by Dr. *Lower's Experiment*, as alſo upon its Stagnation in a Porringer: But if we conſider, that tho' the Serum be the moſt Fluid Part of the Blood, yet it is however liable to great Alterations as to its Fluidity, and is the moſt Fluid when moved with the greateſt Celerity, this Objection will be of no Force. The ſpecifick Gravity of Serum is to that of

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(*e*) *Med. Stat.* § 1. *Aphor.* 41, 50, 89, *and* 91.

Water, as ſix to five, according to Mr. *Boyle*'s Obſervation, but yet this Proportion muſt be various, in different Subjects.

The increaſed Velocity in the contracted Arteries whoſe Vibrations for that Reaſon are quicker, muſt needs break and divide the Blood, whereby it becomes Fluid, and ſo fitter for more Fluid Secretions, and it will likewiſe ſo mix and jumble together, the yet remaining Viſcid Parts, that they cannot in that Confuſion ſeparate from the other.

§ 8. The greater or leſs Quantity of *Saliva*, as (*f*) Dr. *Cockburne* hath proved, increaſes or leſſens both *Appetite* and *Digeſtion*. And the ſame *Author* hath alſo ſhewn, how the greater Weight of the *Air* affects this Secretion.

(*f*) Oeconomia Animalis, *p.* 15.

CHAP. II.

Of the Aſthma.

§ 1. AN *Aſthma* is a Laborious and Difficult *Reſpiration.* It is divided into three Species, *Dyſpnœa*, *Aſthma*, and *Orthopnœa.*

1. A *Dyſpnœa* is a denſe and quick *Reſpiration.*

2. An *Aſthma*, properly ſo call'd, is a frequent and ſtrong *Reſpiration*, in which all the Muſcles ſerving Reſpiration, are vehemently agitated. 'Tis join'd with a *Stertor* and *Wheaſing.* Sometimes *Reſpiration* is ſtrong and ſlow.

3. An *Orthopnœa* is the greateſt Difficulty of Breathing, in which the Patient would be ſuffocated, if he did not ſit upright. In all the three Sorts, *Inſpiration* is more difficult than *Expiration.*

Theſe three Diſtempers only differing in Degrees ; I ſhall Treat of 'em all under the common Term of *Aſthma.*

§ 2. An *Aſthma* being only a greater or leſs Difficulty of Breathing, whatſoever

ever then will interrupt Reſpiration, will cauſe an *Aſthma.*

That Reſpiration may eaſily be perform'd, 1ſt, the Cavity of the *Thorax* muſt be enlarged, that the *Air* may enter the *Lungs.*

2. The *Air* muſt be *Heavy* and *Elaſtic*, without which Properties it wou'd not ſufficiently blow up the *Veſiculæ* in the *Lungs*, to make room for the Paſſage of the Blood thro' 'em; and yet if the *Air* be either too *Heavy* or *Elaſtic*, it will ſtretch the *Veſiculæ* beyond their due Extent, and thereby obſtruct the Paſſage of the Blood thro' the *Lungs.*

3. The Blood muſt be *Fluid*, and in fit Proportion to paſs thro' the *Lungs.*

§ 3. In ſhort then, whatever determins the Spirits in too great a Quantity, or too little into the *Muſcles* ſerving *Reſpiration*, (*viz.* The *Intercoſtals*, both *internal* and *external*, the *Subclavius*, *Serratus Anticus major*, *Serratus Poſticus ſuperior*; or *triangularis*, *Serratus Poſticus inferior*, *Sacrolumbaris*, and *Diaphragma*) by elevating the Breaſt too much, or too little, muſt hinder *Reſpiration*: Nay, if the *Lungs*, the *Aſpera Arteria*, or the Membranes of the Breaſt, be either too lax, too dry, too much ſtreightned by ſpaſmodick Contraction, or windy Inflation, ſtuff'd with a Viſcid Slime, fill'd with *Tubercles*, or Stony Concretions, if there be either Matter, or Water collected in the Cavity of the *Breaſt*, or *Belly-Dropſies*, *Tumors* in the *Liver*, *Stomach*, *Spleen*, or *Meſentry*, in all theſe Caſes *Aſthmatick* Symptoms will enſue.

§ 4. If the Blood be either too much in *Quantity*, too quick in its *Motion*, too much *Rarified*, or too *Viſcid*; it will upon all theſe Accounts paſs more difficultly thro' the *Lungs*, and therefore require the *Lungs* to be more nicely *Inflated*, than will happen in ſuch Circumſtances, for which Reaſon the *Patient* will be *Aſthmatick*.

§ 5. A Fit of the *Periodick Aſthma*, which falls moſt under a *Phyſician's* Care, often happens once in a Fortnight (if cold bad Weather, or ſome Irregularity in Diet bring it not on ſooner) and ſometimes once a Month. I know a *Lady* who hath a Fit every Time her *Menſes* flow; and was rather worſe than better for all the Medicines ſhe had taken for ſeven Years, as ſhe told me when firſt I viſited her: Yet by a Medicine better ſuited to her Caſe, was mightily relieved for almoſt two Years, and continues ſo yet, for ought I know to the contrary. The Fit is generally preceded by a *Flatulency*, and *Diſtention* of the *Stomach*; and invades the *Patient* about one or two of the Clock in the Morning, forces him, if violent, to riſe out of Bed, and ſit upright in a Chair: He finds a great ſtraitneſs at his Breaſt, and ſtrives by all means to draw a greater quantity of *Air* into his *Lungs*: His Urine is pale, and in great quantity; he can neither Cough, Sneeze, Spit, or Speak freely; the *Stomach* is now much more diſtended, and all heating Things increaſe it. The *Fit* is leſs after Vomiting, Purging, or Faſting: When it is violent the Heart *palpitates*, the Pulſe intermits, the Face is almoſt black, and the *Patient* is ſubject to Swooning; when it begins to abate, he Spits plentifully, and not till then; ſometimes a Crude, and ſometimes a Concocted *Phlegm*; which he is not very much troubled with again till the next *Paroxyſm*. His *Urine* is high Colour'd at the latter end of the *Fit*. All ſudden Alterations of the Weather give a *Fit*.

Gill, Hyſſop, Rue, Syrrup of Garlick, Syrrup of Sulphur, Tincture of Lavender, Spirit of Hartſhorn, Myrrh, Saffron, Balm of *Gilead*, Balſam of *Peru*, Bal. Sulphur, Aniſat, Succinat, Terebinthinat, Tincture of Sulphur, with Syrup of Ground-Ivy, Lime-Water, Infuſions of Millipides, Hore-Hound *lb. ſs.* to ſix Gallons of Beer, Vomits, Bleeding and Purging, all theſe prov'd unſucceſsful in the Intervals, (*g*) as a very good Judge in this Caſe informs us.

A full Diet, and eſpecially Debauches, render the *Fit* more ſevere; a dry Air beſt agrees with the *Aſthmatick*: He is free from his *Fits* in Froſty Weather, if it be not too ſevere. Rain when it falls does not much affect him, but the preceding Vapours do; damp Houſes, fenny Grounds, high Winds, and Storms, mightily offend him: Any kind of Smoak is offenſive, but the Smoak of Wood the moſt, and that of *Dutch* Turf the leaſt. In Summer the *Fits* are both more frequent, and ſevere than in Winter. A *Fit* is generally increas'd by the *Heat* of the Fire, or Bed, and eaſed by

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(*g*) *Sir* John Floyer's *Treatiſe of an Aſthma*, p. 18. *and* 19.

opening the Window. All ſtrong Liquors are prejudicial, eſpecially in the *Fit*; new Drink of all Kinds is improper.

All Sorts of Viſcid, Mucilaginous, and Windy Victuals are prejudicial; Meat that ſwells leaſt in the Stomach, is beſt for the Aſthmatick.

Etmuller, *Waldſchtmicdt* and *Baglivi*, commend Vomits, *Laudan. cum Ther. Androm. Millepedes*, *Terebinthinats*, *Balſam* Peru, *Sperma Ceti*, *Anti-hyſtericks*, *Anti-epilepticks*, and Solutions of *Gum Amoniacum*, &c.

Sir *John Floyer* hath try'd moſt of the celebrated Medicines, commended by any of our *Modern Authors* without any Advantage, but found Benefit by uſing the Preſcriptions of the *Ancients*, (*b*) and indeed they are much more agreeable to the *Theory* of this Diſtemper; and they who expect to be ſucceſsful in the Cure of it, muſt vary their Method according to the various Cauſes that produce it, which the foregoing *Theory* will give ſome Light into.

(*b*) Vide Nicol. Myrepſ. de Antidotis, § 1. *cap.* cxxxv. Orabaſii, *lib.* ix. and *cap.* v. & Ætii Tetrab, ib. 11. Sermon. iv. *cap.* lvii.

CHAP. III.

Of a Conſumption.

§ 1. A *Phthiſis* is a Conſumption of the *Muſcular* Fleſh, either with, or without, a *Fever.* 'Tis either *Original* or *Symptomatical.* The *Original* is either *Nervous*, which is call'd an *Atrophy*, or *Pulmonary*: It is the laſt I ſhall only take Notice of in this Place. I ſhall firſt obſerve, what preceeds a *Pulmonary* Conſumption: Secondly, recite the Concomitants of it; and in the next Place take Notice of its Conſequents, in Order to explain ſome of the moſt obvious *Symptoms* that attend it.

§ 2. The *Antecedents* of this Diſtemper are a Suppreſſion of ſome natural, or preternatural Evacuation, without Correcting the Cauſe on which it depended, grievous Paſſions of the Mind; drinking too plentifully of Spirituous Liquors; an idle Courſe of Life, Night Studies; fenny, heavy, and ſmoaky *Air*; an hereditary Diſpoſition; Crookedneſs, ſtrait Breaſts, any thing let fall upon the Lungs, Diſtempers ill Cur'd, and eſpecially catching Cold in theſe Circumſtances.

The Concomitants are,

1ſt. A *Cough*, which is thus diſtinguiſh'd from a *Catarrh*; 'tis owing to *Tubercles*, or ſome other Indiſpoſition in the *Lungs*, with a Senſe of Weight in the Breaſt, and Difficulty of Breathing, and in the Beginning 'tis dry, tho' in the Progreſs of the Diſtemper, it be moiſt.

A *Catarrh* is moiſt in the Beginning, and terminates in a few Weeks, yet is troubleſome and almoſt continual; whereas a Conſumptive Cough is mild in the Beginning, and returns by Intervals; the Patient is Thirſty, his Tongue foul, and loſes his Appetite, and coughs after Meat till he vomit it up: The Voice is hoarſe, or ſqueaking, the Weight is greater in one Part of the Breaſt than the other, and he coughs more, lying on one Side, than on the other.

2. There is a Fever, Loſs of Appetite, Thirſt, reddiſh Urine, quick Pulſe, red Cheeks, eſpecially after Meat, Heat of

the Palms of the Hands, Soles of the Feet, and the *Hypochondres.*

3. Loſs of the Muſcular Fleſh.

The Conſequences of the beginning Conſumption I have been deſcribing, which, if not cured, becomes a confirm'd one, which is attended with a new *Fever* of the *Inflammatory* kind, as *Pleuriſie*, or *Peripneumony*, and afterward with a *Putrid*, and *Intermitting Fever*, and then the *Cough* increaſes, and vaſt Quantities of Matter is expectorated, ſometimes ſweet, and ſometimes fætid, with Night Sweats, Diarrhœa's, ſwell'd Legs, ſore Mouths, Pain in the Throat upon ſwallowing any thing, and at laſt the *Facies Hippocratica*, which terminates in Death.

§ 3. When any Evacuation is ſuppreſſed, whether it be the *Menſes*, the *Hemorrhoids*, *Urine*, or the Matter of *inſenſible Perſpiration*, &c. 'twill neceſſarily induce a *Plethora*, which if it cauſe not a Fever, as it often doth, will, by its greater Weight upon the Veſſels it circulates through, ſo *relax* 'em, as to render them leſs fit to carry on the Circulation; upon which account the Blood will not only paſs through the Capillary Arteries more difficultly, but be apt to depoſit a *Slimy Mucus* upon any part that is diſpoſed to receive it. This greater Quantity of Blood, by diſtending the *Arteries* of the *Brain*, will in ſome Meaſure intercept the Motion of the Spirits through the Nerves, and the greater Viſcidity of the Blood, together with its diminiſhed Celerity, will leſſen the Quantity of Spirits ſeparated in the Brain (by the 20th and 22d Propoſitions of *Animal Secretion)* therefore the force of all the *Muſcles* in the Body, and conſequently of theſe ſerving *Reſpiration*, will be leſſened. Now that this greater quantity of Blood, which is alſo more Viſcid, may paſs with Eaſe thro' the *Lungs*, 'tis neceſſary that the *Lungs* ſhou'd be more Inflated, than at another Time: But, on the contrary, in the preſent Circumſtances, they will be leſs; for their Inflation depending on the Quantity of *Air* admitted into 'em, and that Quantity depending on the greater or leſs Enlargement of the Cavity of the *Thorax*, and this upon the Force of the *Muſcles* ſerving *Inſpiration*, which is prov'd to be leſs in this Caſe; therefore the Blood will be apt either to ſtagnate in the *Lungs*, and ſo cauſe *Inflammations* which may end in *Ulcers*, or leave behind it a ſlimy Matter, which will cauſe *Tubercles* in the *Lungs*, whereby the *Patient* will be inclined to *cough*, but not violently, becauſe the *Tubercles* are not very troubleſome, and there will be a Senſe of Weight in the Breaſt, and a Difficulty of Breathing, eſpecially upon quick Motion; for the ſame Reaſon, the Irritation to cough will be greater, and the Difficulty of Breathing increaſed, by any Thing that leſſens the Cavity of the Breaſt, as a full Stomach will do, by hindering the *Diaphragm* from ſinking in *Inſpiration*; therefore upon *Eating*, the Patient *coughs* till he *vomit*, and ſo eaſes himſelf of the Burthen.

§ 4. If the *Tubercles* be only on one Side of the *Lungs*, the Weight is perceiv'd there, and the Patient coughs more for lying on one Side than the other: The Blood being in this viſcid State, its Motion impair'd, and the Coats of the *Glands* relax'd, will increaſe the Quantity of viſcid Secretions above the Fluid, and alſo the Viſcidity of the ſecern'd Matter, (by the 15th, 20th and 22d Propoſitions of Secretion) therefore the *Glands* of the *Stomach*, the *Aſperia Arteria*, and thoſe [which empty their Contents into the Mouth, will ſeparate a Matter more *viſcid* than ordinary, and alſo in greater Quantity; from whence we may account for the Loſs of Appetite, Thirſt, and Foulneſs of the Tongue, and Hoarſeneſs we obſerve in this Diſtemper; the Viſcidity of the Blood increaſing, and the Quantity of *Animal Spirits* decreaſing, the Orifices of the *Glands* will be mightily inlarg'd, and ſo a *Hectic Fever* will enſue, (by Dr. *Cheyne*'s Theory of that Diſtemper) and conſequently, the *Patient* will be thirſty, loſe his Appetite, make reddiſh Urine, have a quick Pulſe, red Cheeks after Meat, Heat of the Palms of the Hands, Soles of the Feet, and *Hypochondres*, with a Loſs of the muſcular Fleſh.

§. 5. Now if the *Patient*, in theſe Circumſtances, be left to the Tyranny of this Diſtemper, without any *medical Aſſiſtance*, or be treated after ſuch a Manner, as to increaſe the Cauſe of his Diſtemper, (as he generally is, with *Pectorals* and *Balſamics*, which is the Reaſon ſo few are recover'd from this Diſeaſe;) the Symptoms taken Notice of in the laſt *Stadium*, or in a confirm'd Conſumption, will immediately ſucceed: As a *new Fever* of the *inflammatory Kind*, &c. for the *Laxity* of the ſolid Parts increaſing, as alſo the Viſcidity of all the circulating Liquors, the *Tubercula* in the *Lungs* will grow larger every Day than other; the Heat alſo increaſing, will diſpoſe theſe *Tubercula* to inflame, and ſuppurate, which will occaſion *Pleuriſies*, *Inflammation* of the *Lungs*, and at laſt *putrid* and *intermitting Fevers*, when the Impoſthumation breaks. From this *Ulcer* in the *Lungs* will great Quantities of either ſweet or fætid Matter be expectorated by Coughing, and the Viſcidity of the Blood being greater, and the Coats of the *Glands* being alſo more relaxed, a greater Quantity of concocted *Phlegm* will be ſeparated (in thoſe *Glands*, which empty their Contents into the Mouth,) either by *Hawking* or *Coughing* (by the forementionʼd Propoſitions of Secretion,) ſo that the Cough will grow worſe, and the *Patient* will ſpit more: And he will alſo be troubled with Night Sweats; for the Pores of the Skin being mightily inlargʼd, and more ſo in Sleep, than when waking, and the Bloodʼs Motion being accelerated by the Heat of the Bed, upon both theſe Accounts, Sweat will be forcʼd; and if, by any Means, this Evacuation be ſuppreſsʼd, ſome other will be increasʼd, increas'd, which is generally that by the *Glands* of the *Inteſtines*, they being ſo much relax'd, and their Orifices ſo much inlarg'd, for which Reaſon a *Diarrhœa*, and *Night Sweats*, do alternately waſte the Patient's Strength; but if both theſe Evacuations be ſuppreſs'd, the detain'd Matter will fall upon theſe Parts, where its Motion is ſloweſt, and the Reſiſtance to its Preſſure is the leaſt; now the *Legs* being at the greateſt Diſtance, both from the Heart, and Brain, and in the Day-time in a depending Poſture, the Motion of the Blood will be there the ſloweſt, and the Tenſity of the Fibres the weakeſt: Whereas a ſufficient Degree of *Tenſity* is requir'd to reſiſt the diſtending Force of the circulating *Humors*; therefore the *Legs* will ſwell, when theſe Evacuations are ſuppreſs'd. The Coats of the *Glands* being yet more relax'd, will not be able to preſs out their Contents, whereby *Tumors*, and ſometimes ſlight *Ulcerations* will ſucceed, ſo that the Mouth will be ſore, and the Throat pain'd upon Swallowing.

§ 6. I've now, as briefly as I cou'd, accounted for the Production of a *Conſumption*, by the Suppreſſion of ſome natural Evacuation, and could as eaſily ſhew how 'tis brought about by the reſt of the *Procatartick* Cauſes aſſign'd; but this wou'd run me quite beyond my Deſign, and perhaps I may find a fitter Opportunity of doing it, being furniſh'd with a good *Stock* of *Obſervations* of Cures perform'd in this Diſtemper, by a Method and Medicines vaſtly different from what is commonly practis'd and preſcrib'd.

§ 7. I ſhall only now examine, how well the preſent Practice, by *Pectorals* and *Balſamics*, anſwer the Indications taken from the preceding *Theory*: The Indications are principally to render the *Humors* more *fluid*, the *Fibres* more *tenſe*, and to *evacuate* the *viſcid Phlegm*, with which the *Glands* of the Stomach, and thoſe about the Mouth, are ſtuff'd, leſt by a longer Stay the Glands be ſtill further relax'd.

The common *Diſpenſatory Pectorals* are the *Decoct. Pectorale*, *Syr. Botryos*, *Capil. Veneris*, *Glyceriz. Hyſop*, *Scabioſæ*, *Mel & Oximel Scilliticum*, *Succus Glycerizæ*, *Lohoc de Caulibus*, *Farfar*, *Papaveræ*, *Paſſul. Pino*, *Portulac. Sanans*, *Diacod. Spec. Diatragacant. Frigid. Pulv. Haly*; and the moſt famous Simples are *Sugar*, *Honey* and

Liquorice. Now all theſe, except the *Mel. Oximel Scillit.* and *Syr. Scabioſæ* (which are all Vomits) are *ſweet, ſlimy Mucilages*, and are therefore directly contrary to the *Indications* in this *Diſtemper*; for they will both *Relax* the *Solid* Parts, and thicken the *Fluid*, they will fill the *Stomach* with a glutinous Slime, which will mightily *pall* the *Appetite* and weaken *Digeſtion*, and they will alſo increaſe the Thirſt: Whereas the *Medicines* proper in this Caſe, ſhou'd *contract* the Solid Parts, *attenuate* the Fluid, and *evacuate* at due Intervals, the *viſcid Matter* lodg'd in the *Glands*; therefore gentle *Emetics*, mild *Stomatics*, moderate *Exerciſe*, eſpecially by *Riding*, according to Dr. *Sydenham*'s Obſervation, a clear dry *Air*, the Uſe of the *Cold Bath*, provided the Patient ſtay but a little Time in at once, and the Diſtemper not far advanc'd, *Bliſtring Plaiſters* frequently apply'd, with a Diet of *eaſy Digeſtion*, will beſt anſwer our Expectation in the *Cure* of a Beginning *Conſumption*: But when the Diſeaſe is arriv'd at its laſt *Stadium*, nothing but Death is to be expected: The beſt that a *Phyſician* can do in this Caſe, is only to mitigate the Symptoms in Order to make the Remains of Life more comfortable. Yet 'tis not eaſy even in this *Stadium* of the Diſtemper to make certain and infallible *Prognoſtics* : I've more than once been deceiv'd in the Recovery of a Patient, whoſe Symptoms gave not the leaſt Encouragement to expect it. The firſt Caſe was of a *Baker*, (and *Bakers* according to (*g*) *Ramazini*'s Obſervation, are ſubject to this Diſtemper, which Thing I've alſo myſelf obſerv'd) who had been troubled with a *Cough* for above Twelve Months, which gradually increaſed, till he was in the following Condition. When I firſt viſited him, his Stomach was loſt, his Thirſt very great, his *Urine* red, and let fall a *Lateritious* Sediment, his Tongue foul, Sweat prodigiouſly every Night, Cough'd almoſt continually, and expectorated vaſt Quantities of concocted *Pus* with Streaks of Blood in it, which often ſmell'd abominably : His Fleſh was gone, and by Reaſon of Weakneſs was ſcarce able to riſe from his Bed : In this deplorable Condition, at his earneſt Deſire, I ordered ſuch Things as I thought moſt fit

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(*g*) De Morbis Artificum, *p.* 184.

to mitigate the Symptoms, without giving him the leaſt Hopes of a Recovery; but contrary to my Expectations, the next Time I ſaw him, which was about a Week after, he was much better, and by a ſtrict Obſervance of Directions, in a Month's Time was fit for Drinking the *Chalybeat Waters*, which I order'd him, and thereupon he recover'd without Relapſe. The Medicines that recover'd him were ſuch as were indicated by the foregoing *Theory*. And as for *Balſamics*, they are uſeful in this Diſtemper, in as much as they are *Stomachics*, or *Diuretics*, in which Virtues they may eaſily be improv'd by *Acid* or *Saline* Mixtures; for by themſelves, if taken in conſiderable Quantities, they generally both *pall* the Stomach, and *heat* the Blood, and ſo rather promote than abate the *Symptoms* of this Diſtemper: But for the Ends for which they are uſually preſcrib'd, they are altogether improper; for were they immediately apply'd to the ulcerated Part, they wou'd be of little Advantage; for the ſame Reaſon they are diſcarded the Practice of *Chyrurgery*, by the moſt Skilful in that Art: But ſo far are they from being immediately apply'd to the Part affected, that but little of them enter the Maſs of Blood, and that very much alter'd from what they were when taken in at the Mouth. All *Balſams* whatſoever are much more *Viſcid* than the Matter ſeparated in any of the *Glands*, and the *Viſcidity* of the ſeparated Matter being as the Number of *Plications* in the complicated Artery (*by the 2d Corol. of the 9th Propoſition of Secretion*) therefore to ſeparate a Liquor more Viſcid, than what is ſeparated in any other of the Glands, as *Balſams* are, the *Inteſtines*, which anſwer to the Artery, ought to be more complicated, than any Artery of which a Gland is compos'd; whereas the *Teſticulus Humanus* is 50 Times more complicated than the *Inteſtines*; for the *Plications* of the Inteſtines are not above 96, as (*k*) Dr. *Cheyne* hath obſerv'd; and thoſe of the *Teſticulus Humanus* are 4800, for (*l*) *Bellini* tells us, the Length of the complicated Artery of the *Teſticulus Humanus* is 300 Ells, and the Altitude $\frac{1}{16}$ Ell; therefore the Number of *Plications* muſt be 4800. Now as 96. 4800. 1. 50. therefore if *Balſams* were only of equal Viſ-

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(*k*) *New Theory of Fevers*, p. 50.

(*l*) De motu Cordis, Pro. 40.

cidity with the Matter ſeparated in the *Teſticles*, the *Guts* in Order to ſeparate them into the *Lacteals*, muſt be either 50 Times longer, that they might be 50 Times more complicated, or the *Balſams* muſt be made 50 Times more Fluid, and hereby loſe all the Properties of *Balſam.* So that *Balſamics*, as ſuch, can never come at the Part affected, and therefore never heal it.

Some will be apt to imagine from what I've ſaid, that I aſſign too ſmall Diameters to thoſe Particles of *Chyle* which enter the *Lacteals*, whereas they are no ſmaller than what's neceſſary for the Preſervation of our Lives and Healths; for was any Particle of indiſolvable ſolid Matter, ſuch as *Stones*, or *Minerals* (both which are us'd in Medicine) to enter the *Lacteals*, and if the Diameter of ſuch Particles was greater than the Diameter of the ſmalleſt Veſſels in a Humane Body, they would obſtruct 'em, and cauſe *Inflammations*, *Gangrenes*, and *Death* at laſt. Now *Leeuwenhoek*, with his *Microſcopes*, hath diſcovered Veſſels in a Humane Body, whoſe Diameters are 79200 Times leſs than an Inch, and ſo ſmall at leaſt ought the Diameters of the *Lacteals* to be.

Cor. 1. Hence we may ſee how neceſſary 'tis, that all hard, ſolid Medicines, (ſuch as *Steel* and *Teſtacious Powders*) ſhou'd be finely Levigated, if we expect any Advantage from them in the Blood.

Cor. 2. That theſe Medicines, as they are commonly prepar'd, only exert their Force in the *Primæ Viæ*, and are of no Uſe to correct the ſuppos'd *Luxuriant Acids* in the Blood.

CHAP. IV.

Of a Dropſy.

A *Dropſy* is a watry Swelling, either of the whole Body, or Part of it. 'Tis divided into two Species, *viz.* the *Anaſæara* and *Aſcites.* In the firſt, the Tumor is moſt in the Legs, and receives the Impreſſion of the Finger, but the *Pit* remains not ſo long as in a *Leucophlegmacy*: The *Urine* is ſometimes pale and plentiful, the Patient hath no Thirſt, tho' he loſe his Appetite. In the *Aſcites* the Tumor is in the Legs, Thighs, Belly, and *Scrotum*, the *Water* is forc'd ſometimes into the Cavity of the *Abdomen*, and at other Times into Veſſels it forms itſelf, either from ſome dilated Membrane, or obſtructed *Lympheduct*: The Water is of various Colours; 'tis Salt, *Lixivious*, a little Corroſive, and Frothy, when mix'd with common Water: The *Urine* is red, lets fall a red Sediment, and little in Quantity: The *Thirſt* is exceſſive, and the *Appetite* very little.

The *Antecedent* Cauſes are much the ſame with thoſe of a *Conſumption*, excepting ſuch, as more eſpecially reſpect the *Lungs*, which is the Reaſon that determins the preceeding Diſorder to a *Conſumption*, rather than a *Dropſy*; for whatever preceeds either a *Conſumption*, or *Dropſy*, diſpoſes the Humors to be viſcid, and the Fibres lax: The Laxity of the Fibres in a *Dropſy*, is both greater and more univerſal than in a *Conſumption*, and the Motion of the Blood ſo ſlow, that *Perſpiration* is almoſt intirely ſuppreſs'd, ſo that a Load of *Serum* will be thrown on ſuch Parts as are fitteſt to receive it: And theſe are ſuch as are *depending* and moſt lax, ſuch as the *Legs*, *Thighs*, and *Viſcera*. The *Aſcites* ſeldom happens without ſome Fault in the *Kidnies*, or a preceeding *Jaundice*, Tumor in the *Liver*, or ſome other of the *Viſcera*, whereby the *Lymphatick Veſſels* are either mightily diſtended or broken: But the *Jaundice* and theſe Tumors may eaſily be produc'd by lax Fibres, and viſcid Blood. (*m*) *Doleus* and (*n*) Dr. *Leigh* have both obſerved the *Omentum* in

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(*m*) Encyclopedia Medicinæ, &c. p. 364.
(*n*) Exercitatio de Hydrope.

in Dropſies either full of Tumors, or elſe putrify'd; and 'tis from this Obſervation, among ſome others, that *Doleus* ſuppoſes a Paſſage from the *Stomach* to the *Bladder*: But theſe *Tumors* may as well be the Effect, as Cauſe of the Diſtemper; for even the *Jaundice*, Tumors in the *Liver*, *Spleen*, *Pancreas*, *Meſentery*, *Omentum*, &c. may (by ſuch a State of the Solids, and Fluids, as I've aſſign'd) be produc'd, as I have obſerved before. As the Viſcidity of the Blood daily increaſes in *Conſumptions*, for the Reaſon aſſign'd in the preceding Chapter; ſo, in this Caſe, the Blood grows every Day more watry; for the Laxity of the Fibres being ſo very great, and the Motion of the Blood ſo ſlow, the complicated Arteries, of which the Glands are compos'd, cannot be ſufficiently *diſtracted*, and therefore will ſeparate very little from the Maſs of Blood; ſo that the Quantity of *Serum* will continually increaſe, and the Motion of the Blood being ſo ſlow, the fibrous Parts will retire into the Middle of the Canals in which it moves, even as it doth, when taken into a Porringer, and force the *Serum* againſt the Sides of the Veſſels, till the Preſſure become ſuch, as to drive the *Serum* thro' the Pores of the Veſſels, and lodge it in their *Interſtices*: Or elſe ſo dilate ſome of 'em, as to form *Veſicles* to contain it.

From theſe ſhort Hints I've given about this Diſtemper, 'tis evident, that the Cure of a beginning *Dropſie*, is to be attempted by ſuch Means as ſtrengthen the *relax'd Fibres*; render the Humors more fluid; increaſe the Celerity of the Blood's Motion, and promote ſome, or all the *Secretions*, of which that of *Urine* and *Perſpiration* are the beſt adapted to anſwer our Expectation: But in moſt *Hydropic* Caſes, 'tis very difficult to increaſe any of the *Secretions*, and eſpecially that of *Urine*. When the *Primæ Viæ* are obſtructed, *Urine* is better promoted by gentle *Purges* than *Diuretics*, and I have found, that Preparations of *Tartar* beſt anſwer this End; and that when the *Stomach* and *Guts* are well cleanſed, an *Infuſion* of *green Tea*, in *Rheniſh Wine*, is not only a good *Diuretic* and *Stomachic*, but increaſes the Celerity of the Blood's Motion, and at the ſame time abates the Thirſt, whereas all other *Bitters* I've yet try'd, increaſe it.

Dry Food, *Diuretics*, *Diet-Drinks*, *Exerciſe*, tho' never ſo violent, provided it weary not the Patient too much, a *dry Air*, the *Cold Bath*, and *Pleaſant Company*, are of a greater Neceſſity in the Cure of this Diſtemper, than any Sort of Medicines without 'em.

Dr. *Willis* tells us of ſome cured of an *Anaſacra*, only by removing their Habitation from a foggy to a dry Air; and I queſtion not, but that ſeveral Diſtempers may be as *ſafely* and *pleaſantly*, tho' not ſo ſpeedily cured, by a regular Uſe of the *Non Naturals*, as by any Means whatſoever.

CHAP. V.

Of Acute Diſtempers, and in particular of a Fever.

§ 1. A*Cute Diſtempers*, whether they be *Fevers*, *Pleuriſies*, *Rheumatiſms*, *Cholicks*, &c. eſpecially thoſe attended with *Pain*, generally proceed either from a too great *Contraction* of the ſolid Parts, too *violent Motion* in the fluid Parts, or both theſe together.

§ 2. Dr. *Cheyne*, in his *New Theory of Fevers*, hath prov'd at large, that the general Cauſe of *Acute Fevers* is an *Obſtruction*, or *Contraction* of the *Glands*, whereby the Quantity of Blood, and *Liquidum Nervorum*, is increas'd; from whence all the Symptoms of *Fevers* may be accounted for.

§ 3. If the *Pain* be great, eſpecially in *membranous* Parts, it will either cauſe or increaſe a *Fever*, for it is always attended with a *Contraction* of the pained Part, (as is evident from the (*o*) *Bellinian Doctrine de Stimulis*) and by this *Contraction*, the Motion of the Blood and Spirits is either totally obſtructed or retarded, and the Part ſwelled, and by their Preſſure againſt the Sides of the containing Veſſel, more forcibly, as they will, when their direct Motion is hinder'd, the Pain is both increaſed, and propagated further, and the *Contraction* is more or leſs communicated to all the Parts of the Body, whereby *Secretions* are ſtopped, and the Quantity of Blood increaſed, which will either cauſe or increaſe a *Fever*. Beſides Pain, which is a *Stimulus*, makes more denſe and ſtrong Vibrations of the ſolid Parts, and ſo divides the Blood into ſmaller Parts, which muſt therefore take up more Room; for the *Surfaces* of Bodies, upon their Diviſion, do not decreaſe ſo faſt as their *Solidities*, theſe being in a *triplicate*, as thoſe are in a *duplicate Proportion*, to their Diameters: So that the more Bodies are divided, the more ſenſible Space they fill; and this is all one, as if the Magnitude of the Particles had continued the ſame, and the Quantity been increaſed, ſee-

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(*o*) Bel. de Urin. & Pulſibus, *p.* 165.

ing all the Effects of an increaſed Quantity are hereby produced.

§ 4. This greater *Fluxility* of the Blood will ſupply a greater Quantity of *Animal Spirits*, as is known to any who underſtand the Nature of *Secretion*, and being that a *Fever is but the increaſed Circulation of the Blood*, and the *Velocity* of the Blood's Motion being in compound Proportion of the frequency and Strength of the Heart's Contraction directly, and the *Reſiſtance* it meets with reciprocally, and theſe, depending upon the quantity of *Animal Spirits*, ſerving for the Contraction of the Heart; and the *Reſiſtance* being leſs, from the greater *Fluxility* of the Blood, therefore the greater *Fluxility* of the Blood will cauſe, or increaſe a *Fever*.

§ 5. I ſhall now ſhew, how the moſt obvious *Symptoms* of a *Fever* are accounted for, from the too great *Velocity* of the Blood.

§ 6. The Pulſe in a *Fever* is ſtrong, or quick, or both; the Patient is hot, and dry and reſtleſs, he is thirſty, his Tongue is foul or dry, he is watchful, then deliræous, convulſed, and the Pulſe is now weak and intermitting, and then the Patient falls into cold Sweats, and dies.

§ 7.

§ 7. The Blood cannot move more ſwiftly thro' the Arteries, unleſs the Heart contract more frequently, more ſtrongly, or both; now the Dilatation of the Arteries, or the *Pulſe*, keeps Time with the Contraction of the Heart, and is more or leſs *dilated*, as the Heart is more or leſs *contracted*; therefore, if the Celerity of the Blood be greater, the Pulſe muſt be *quicker*, or *ſtronger*, or both.

§ 8. The Blood moving more ſwiftly, every Part of the Body will receive a greater Share of it, in the ſame Space of Time, than it would have done, had it mov'd more ſlowly: The Blood being always hot, (be it from what Cauſe ſoever it will) therefore every Part of the Body receiving a greater Quantity of Blood, will be ſenſible of a greater Heat. And this Propoſition may ſo eaſily be demonſtrated, that I ſhall not ſtay upon it, *viz. That* (Cæteris paribus) *the Heat of an Animal is in compound Proportion of his Quantity of Blood, and the Celerity of its Motion.* There may ſeveral other Things contribute to the greater Heat of the Patient; but this is certain, and evident from an increaſed Celerity.

§ 9. This great Heat will make him both *dry*, by evaporating the thin Parts, and *reſtleſs*, or, which is all one, to change his Poſture frequently, in Order to eaſe himſelf of the Torment he endures.

§ 10. This Heat will alſo act as an univerſal *Stimulus*, whereby all the Glands will be ſtraitened, and, conſequently, the ſecern'd Matter will be thinner, or more fluid, and the remaining Part of the Blood more ſolid, than in a natural State; therefore he will be *dry*, as well as *hot*.

§ 11. The groſs Parts of the Blood being retained in this Condition, it is therefore more viſcid; beſides, its Viſcidity is increas'd by its Heat, as is known by Experiment; for if you apply a much leſs Degree of Heat, than will boil Water, it will turn the *Serum* into *Jelly*. The Heat of the Blood is greater in *Fevers*, than moſt imagine. The Heat of a Man's Skin, whoſe Pulſe beats ſixty Strokes in a Minute, is to the Heat of boiling Water, as 16 to 52, as appears by the *Thermometer*; ſo that boiling Water is but little more, than three Times as hot as the Blood of a healthy Man. Now, if the Heat of the Blood ſhould in-

increaſe in Proportion to the Frequency of the Pulſe, (as it muſt, if the Pulſe beat with the Strength it did, and generally it is ſtronger;) a Man then, whoſe Pulſe beats 195 Strokes in a Minute, would be as hot as boiling Water; and it is common for a *Feveriſh* Pulſe to beat 120 Strokes in a Minute. Hence we may account for the *Syzineſs* of the Blood in *Pleuriſies*, and other *Inflammatory Diſtempers*, and ſo be reſcued from the dangerous Practice of thoſe, who, becauſe they obſerve themſelves, or have been told by others, that *Volatile Salts*, and *Spirits*, ſuch as *Hartſhorn*, *Sal Armoniac*, &c. will diſſolve the *Serum*, when coagulated by an *Acid*; therefore preſcribe theſe hot, ſtimulating Medicines, to the imminent Hazard, if not Deſtruction, of their Patients. And this they do, from a miſtaken *Hypotheſis*, that the *Syzyneſs* of the Blood, is owing to a *Coagulating Acid*. The contrary to which Dr. *Pitcarne* hath proved in one of his Diſſertations. (*p*)

§ 12. The Blood will then be made viſcid upon ſeveral Accounts; and from

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(*p*) Diſſertatio de Operæ quam preſtant, Corpora, *&c.*

this viſcid Blood will be ſeparated a leſs Quantity of *Saliva*, and that more ſlimy than in a natural State; the Quantity of ſecerned Matter being in a reciprocal Proportion to the Viſcidity of the Blood, by the 17th Propoſition about *Animal Secretion*: And alſo, becauſe the greateſt Quantity of *Saliva* is ſeparated, when the Blood moves the moſt ſlowly, as appears by making a Ligature upon the *Jugulars*. Hence both the Foulneſs and Dryneſs of the Tongue.

§ 13. The Orifices of the Glands being ſtraitned, by the ſtimulating Heat, the Quantity of *Saliva* will ſtill be leſs; and the Heat ſpeedily evaporating the moſt fluid Part of it, the whole Mouth muſt be exceeding dry; whence proceeds that unquenchable Thirſt, Perſons complain of in *Fevers*.

§ 14. This greater Velocity of the Blood, will ſend a greater Quantity into the Brain, in a given Time; and an increaſed Velocity increaſeth the fluid Secretions more than the Viſcid, by the 20th *Propoſition of Secretion*. The *Animal Spirits* being the fineſt of any ſecerned Matter, the *Exility* of their Parts rendring them inviſible. There-ſore, upon both Accounts, an increaſed Velocity of the Blood will increaſe the Quantity of *Animal Spirits.* Their Quantity being greater, the *Nervous Tubes*, and all the Motory Fibres, will be fuller, and more *tenſe*, whereby *Senſation* will be ſtronger. Now ſince it is a neceſſary Requiſite in *Sleep*, that the Fibres ſhould be *relax'd*, and the *Animal* void of Senſation, and being neither of theſe can happen when the *Animal Spirits* are ſeparated in greater Quantity, as they will be, when the Blood moves more ſwiftly; therefore the greater Velocity of the Blood will prevent Sleep, or the Patient will be watchful.

§ 15. And he will be alſo *delirous*; for the Nerves being fuller of Liquor, its *Undulations* will be more *denſe* and *quick*, Senſation will be more lively, and leſs Impulſes upon the Extremity of the Nerves will cauſe it. And the more lively any Impreſſion is, the greater Attention the *Soul* beſtows upon it: Whether it be attended with Pain, or Pleaſure; and ſo more regardleſs of former *Ideas*, being intirely imploy'd about the preſent Senſation. Now obſerve a Perſon in this Condition, whoſe Senſes are ſo quick, that the moſt trivial Object will affect him. Suppoſe him ſo intent upon the preſent Objects, as to mind nothing elſe, and to ſpeak of what he obſerves, juſt as *Ideas* come into his Mind, without exerciſing his Judgment, in comparing them with former *Ideas* laid up in his Memory, his Talk muſt needs be incoherent, or in other Words, you will ſay, he is *delirous*.

Beſides this, the Blood having acquired a greater Solidity, by the Evaporation of its thin Parts, and its Celerity being ſo much increaſed, the Strokes upon the Extremity of the Nerves will be ſo much ſtronger, whereby the *Reflux* of the *Nervous Fluid* to the Brain, will be as quick, as if the Motion of the Blood was ſlower, and the Nerves were ſtruck upon by *Effluvia* from external Objects; ſo that the ſame *Ideas* will be excited, as if thoſe Objects were really preſent; and the Actions of Men being always ſuitable to the *Ideas* they have, there will be ſuch Actions as are produc'd by external Objects, when none ſuch are preſent; ſuch as thoſe conſequent upon *Joy*, *Fear*, *Anger*, *Revenge*, &c. In this Caſe, the By-ſtanders will conclude they act irrationally, or are *delirious.*

§ 16. *Convulſions* are nothing but the *involuntary* Contraction of the Muſcles: The Muſcles are contracted by an *Ebullition* of the Arterial Blood, and Animal Spirits: The Animal Spirits are derived into the Muſcles, by the Command of the *Will*, or by ſhaking of the Nervous *Tubes*, through which they are convey'd. How the Nerves may be ſhaken, and that irregularly too, in the ſuppoſed Circumſtances, is evident from the laſt Sect: But *Convulſions* from this Cauſe are generally ſtrong, and happen not ſo often as the other I am about to account for, which is called *Twitching*, or a *Subſultus Tendinum*; and they are cauſed after this Manner.

The Celerity of the Blood's Motion, and its Heat continuing, muſt at length render it ſo viſcid, that few, or none, of the Particles are ſmall enough to enter into the narrow Orifices of the Nerves; the Supply of Spirits being hereby cut off, their Quantity will continually decreaſe, till it be ſo ſmall as not to keep the *Antagoniſt* Muſcles equally contracted. The Entrance of more Spirits into that Muſcle is not only prevented, but the Spirits remaining in that Nerve, which terminated in the contracted Muſcle, are forced back, into that Place where there is the leaſt Reſiſtance; and that is the *Antagoniſt* Muſcle, being now relaxed, whereby that Muſcle is contracted, and the other relax'd, and ſo alternately; and ſince the Quantity of Spirits is ſo ſmall, the Contraction of the Muſcles will be very weak, and the convulſive Motion will be a ſort of *Trembling*, or *Twitching.*

The Influx alſo of the Spirits into the Nerves, by the Pulſation of the Arteries being alternate, ſo would their Efflux thro' the Emiſſary into the Muſcles, were it not for the Fulneſs of the Nerves, whereby the Efflux becomes continual; therefore when the Nerves are much emptied, the Efflux will be ſenſibly alternate; whereby the Muſcle will be alternately contracted, or there will be *Twitchings* of the *Tendons.*

§ 17. The Patient, in this Condition, hath a weak and interrupted Pulſe, and in a cold Sweat.

The Pulſe is weak, by the Defect of Spirits to contract the Heart, and becauſe the Blood grows ſtill more viſcid, by loſing its Serum in Sweat, its Motion through the Arteries muſt be ſlower; whereby the Reſiſtance to the Contraction of the Heart will be greater. Therefore a greater Quantity of Spirits muſt be derived into the Heart, to overcome this greater Reſiſtance; and ſo a longer Time muſt be ſpent before the Heart be contracted, or the Interval, between the two Pulſations of the Artery, will be greater: But the Reſiſtance being overcome, and the Contraction of the Heart being ſtronger, cauſed by a greater Quantity of Spirits derived into the Heart, in a longer Time, the Contraction will be quick as uſual, till the increaſed Reſiſtance put a new Stop to it, or the Pulſe will intermit.

§ 18. The Deficiency of Spirits muſt needs relax all the Fibres, ſo that the Pores of the Skin will be exceeding wide, and therefore the Patient will *ſweat*; and becauſe the Motion of the Blood is ſo very ſlow, the Heat of the Blood, and conſequently of the Sweat, will be leſs than that of a healthy Perſon, for which Reaſon he will judge it *Cold.*

§ 19. The Spirits ſtill waſting, and the Viſcidity of the Blood increaſing, at length, they will be unable to contract

tract the Heart, and ſo the *Circulation* of the *Blood* will *ceaſe*, or in other Words, the *Patient* will die.

§ 20. From hence we may conclude, how fit they are to be truſted with the Patient's Life, who, inſtead of *curbing* the too *impetuous Motion* of the Blood with *cooling Diluters*, and *moderate Evacuations*, do *ſpur* it on faſter, with their heating *Cordials* and *Alexipharmicks*.

Though I have not attempted to explain every *Phænomenon* in the Diſtempers I have mention'd, (for that would have run me quite beyond my preſent Deſign in this ſhort Eſſay) yet from what has been ſaid, may be drawn ſeveral practical *Corollaries*, to direct us in a more rational Method than that which is too commonly, and every Body knows, but too *unſucceſsfully* practis'd.

CHAP.

CHAP. VI.

Of the Air.

§ 1. THE *Air* which we continually breathe, and which conſtantly environs us, muſt needs impart its benign, or baneful *Influences*, according to the various Changes it undergoes, as to its *Gravity*, *Elaſticity*, *Moiſture*, *Dryneſs*, *Heat*, or *Coldneſs*; or as it has more or leſs foreign Particles, ſuch as *Mineral*, *Vegetable*, and *Animal*, floating in it.

The *Air* is a compreſſible and dilatable *Fluid*, covering the Earth and Sea to a conſiderable Height, the lower Parts being always more compreſs'd than thoſe above, and the Spaces into which it may be compreſs'd, are always reciprocally proportional to the compreſſing Weight; and becauſe its Denſity is proportional to its Compreſſion, its Particles do recede from each other, with Forces reciprocally proportional to the Diſtances of their *Centers*, as Sir *Iſaac Newton* hath demonſtrated. (*q*)

§ 2. That the *Air* is really *heavy*, was firſt found out by *Galileus*, by trying to what Height Water might be rais'd by Pumping; and when he found it could not be rais'd higher than thirty-five Foot, concluded that it was from the *Counter-ballance* of the *Airs* Weight that it was rais'd ſo high, and not from an imaginary *Fuga Vacui*.

§ 3. The Specifick *Gravity* of *Air* to *Water*, according to Mr. *Boyle*'s Experiments, is as 1 to 1000; but comparing this with the Obſervations of Mr. *Halley*, and Sir *Iſaac Newton*, 'tis perhaps, nearer the Truth to aſſign the Denſity of *Air* to *Water*, as 1 to 800, and the Denſity of *Mercury* to *Water* being as 14 to 1, the Denſity of *Air* to *Mercury* will be as 1 to 11200; ſo that the *Air* we breathe in, takes up 11200 times the Space that the like Quantity of *Mercury* would: And yet (*r*) Mr. *Boyle* hath found by Experiments, that the *Air*,

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(*q*) Principia Philo. Mathem. *p.* 23. *L.* 2.

(*r*) *Tracts about the admirable Rarefaction of the Air.*

without any *adventitious* Heat, may, by the Force of its own Spring, poſſeſs *thirteen thouſand times* the Space it doth when preſſed by the incumbent *Atmoſphere*, and therefore may poſſeſs a Space *one hundred and forty five Millions and ſix hundred thouſand times* greater than the ſame Weight of *Mercury*, and, by the Addition of Heat, it may be forced to fill a Space much larger. Now if we conſider that the *Air* we breathe in may be compreſſed into 40 *times* leſs Space than that which now it fills, it may then poſſeſs a Space *five hundred and twenty thouſand times* greater at one time, than at another, for 13000 x 40 =520000.

§ 4. This *Fluid* I have been deſcribing, is ſo neceſſary, that an Animal cannot live a few Moments without it, as is evident from Experiments of their ſudden Death in the *exhauſted Receiver*; *as* alſo for this Reaſon, *that* ſo ſoon as the Blood ceaſeth to *circulate*, the Animal dies; and it cannot circulate thro' the Body, unleſs it paſs the *Lungs*, which it cannot do ſo long as they are unblown up. And it is only the *Air*, which, by its *Weight* and *Spring*, is able to dilate the *Trachea*, and puff up the little *Air*-

Bladders, whereby the Sides of the Blood-Veſſels are drawn aſunder, and Room made for the Paſſage of the Blood thro' the *Lungs*. And yet if the *Air*, by its greater Gravity, or Spring, ſhould diſtend the Branches of the *Trachea*, and ſwell the *Air-Bladders* above what is neceſſary to increaſe the Diameter of the Blood Veſſels to their greateſt Length; it wou'd then, by taking up too much Room, preſs the Sides of the Blood Veſſels together again, and ſo either retard or obſtruct the Motion of the Blood through the *Lungs*. I ſhall tranſcribe ſome Propoſitions (*ex iis, quæ in prima parte reſpirationis*, &c.) of *Bellini*'s, in his Preface to his Book *de Urinis & Pulſibus*, &c. to confirm my own Reaſoning on this Head. ‘ *Propoſitio* 22. *Sanguis fluere per* ‘ *Pulmones debuit, nec potuit iis non in-* ‘ *flatis, potuit tamen per reliqua Viſcera.*

P. 23. ‘ *Ducto in pulmonem aere ejus* ‘ *momenti, quod ramis tracheæ ad obtuſum* ‘ *angulum convertendis, inflandiſq; folli-* ‘ *culis ſufficiat, non tamen tanti, quod per* ‘ *nimiam folliculorum extenſionem iis ad-* ‘ *volutos canales ſanguinis occludat, totus* ‘ *pulmo ſimul inflabitur, & ſanguis per ip-* ‘ *ſum fluet.*

P. 24. ‘ *Sanguis nihil patitur ab Aere,* ‘ *cujuſcunq; momenti ſit, dum in pulmonem ducitur, neq; cum redditur, ſi minoris, aut majoris momenti fuerit: at vero* ‘ *cum expiratur aer momenti mediocris,* ‘ *tum ſanguis ab ipſo ſolvitur in minimas* ‘ *partes, & quidem ſub ipſum expirationis initium, nihil deinde patiens per totam reliquam expirationem.*

P. 25. ‘ *Aer æquo rarior, & æquo denſior non eſt idoneus reſpirationi, & utervis reſpiretur inter varias, & plures affectiones, brevi animal moritur.*

§ 5. Let us now conſider what happens upon the Inflation of the *Lungs.*

There is hereby Room made for the Blood to paſs through the *Lungs*, which it cou'd not do before; ſo that were the *Lungs* to continne in this inflated Condition, there would be nothing to obſtruct the Motion of the Blood through them, with whatſoever Celerity the Contraction of the right Ventricle of the Heart wou'd propel it.

Now the *Air* cannot remain in the *Lungs* without being much heated, and thereby have its Spring *unbent*, and ſo become ſpecifically lighter than the external *Air*. For which Reaſon it will, by a known Principle in *Mechanics*, give place to it, and riſe to ſuch a Height, as, till it meet with *Air* of its own Weight, and there it will remain.

Suppoſing then the *Lungs* always blown up, yet there would be a conſtant Supply of freſh *Air*, for all the Purpoſes the *Air*, as ſuch, can be uſeful.

Therefore they are miſtaken, who think, that Reſpiration (*viz.* an alternate Inflation and Sinking of the *Lungs*; together with a Contraction and Relaxation of the Muſcles ſerving Reſpiration) is perform'd in an *Animal*, for the End the Blood may *circulate* thro' the *Lungs*, or that the *Air* may, hereby, blow up the Flame of Life, or *ventilate* and cool the too hot Blood in its Paſſage through the *Lungs*, or carry off the *fuliginous* Parts of the Blood; nor yet to impart its *Nitrous Salts* to diſſolve the Blood, nor its *Elaſtic* Particles to communicate an *Oſcillatory* Motion to the Blood: Some of theſe being generally ſuppos'd as the End of Reſpiration. For all theſe Ends, may be obtain'd, even whilſt the *Lungs* remain inflated: Therefore *Nature*, which does nothing in vain, never deſign'd Reſpiration for any of theſe Ends, which may be accompliſh'd as well without it.

§ 6. Now, ſince in Fact there is ſuch a Thing as Reſpiration, let us obſerve what will happen, when, by any Means whatſoever, the *Air* is forc'd out of the *Lungs*.

§ 7. The Sides of the Blood Veſſels, which by the Inflation of the *Lungs*, were drawn aſunder, will now, the *Lungs* being crowded on a Heap, be forc'd together, and ſo the Blood contain'd in them, broken, and divided into innumerable ſmall Parts, and thereby render'd more fit to paſs the ſeveral *Strainers* of the Body.

§ 8. From what hath been ſaid, it follows, that *Air* either too *denſe* or *rare*, (tho' it be not to ſuch a Degree as to become Mortal) as it is unfit for Reſpiration, ſo muſt neceſſarily be unhealthful, and conſequently the higheſt Hills are unwholſome, as well as the loweſt Vallies.

§ 9. And as the Blood upon this Score muſt be leſs broke and divided, it will diſpoſe to all thoſe Diſtempers which proceed from a too great Viſcidity therein.

But there is ſcarce any *Chronical Diſtemper* but which may either derive its Original from, or owe its Growth to this

Cauſe: As the *Jaundice*, *Cachexy*, *Dropſy*, *Aſthma*, *Ague*, and the *Hypochondriacal Illneſs*; and there is no Diſtemper wherein the Change of *Air* is more uſeful than in *Conſumptions*, ſometimes doing more than any Medicine whatſoever could perform without it.

§ 10. Our Bodies are equally preſs'd upon by the incumbent *Atmoſphere*, and the Weight they ſuſtain is much greater than is commonly imagin'd, being equal to a *Cylinder* of *Air*, whoſe *Baſe* is equal to the *Superficies* of our Bodies. Now a *Cylinder* of *Air*, of the Height of the *Atmoſphere*, is equal to a *Cylinder* of *Water* of the ſame *Baſe*, and 35 Foot high, as appears by *Gallileo*'s Experiment of Pumping: So that every ſquare Foot of the *Superficies* of our Bodies, is preſs'd upon by a Weight of *Air* equal to 35 *Cubical* Feet of Water, and a *Cubical* Foot of Water being found by Experiment to weigh 76 Pounds *Troy* Weight; therefore the Compaſs of a Foot Square upon the *Superficies* of our Bodies, ſuſtains a Quantity of *Air* equal to 2660 Pound Weight, for $76 \times 35 = 2660$, and ſo many Foot Square as there is upon the *Superficies* of a Body, ſo many Times 2660 Pounds Weight does that

Body bear. So that if the *Superficies* of a Man's Body was to contain 15 ſquare Feet, which is pretty near the Truth, he wou'd ſuſtain a Weight equal to 39900 Pounds *Troy*, for 2660 × 15 = 39900, which is above thirteen *Ton.*

§ 11. The Difference of the Weight of the *Air* that our Bodies ſuſtain at one Time more than at another, is alſo very great. The whole Weight of *Air* which preſſes upon our Bodies when the *Mercury* is higheſt in the *Barometer*, is, as I have already prov'd, equal to 39900 Pounds *Troy*. I ſhall now prove that the Difference between the greateſt, and the leaſt Preſſure of the *Air* upon our Bodies, is equal to 3982 Pounds *Troy*.

The Difference of the *Air*'s Weight at different Times, is meaſured by the different Height to which the *Mercury* is *buoyed* up in the *Barometer*, and the greateſt Variation of the Height of the *Mercury* being three Inches, a Column of *Air* of any aſſignable *Baſe* equal to the Weight of a *Cylinder* of *Mercury* of the ſame *Baſe*, and the Altitude of 3 Inches will be taken off from the Preſſure upon a Body of an equal *Baſe*, at ſuch Times as the *Mercury* is three Inches lower in the *Barometer*. So that every Inch ſquare of the Surface of our Bodies is preſs'd upon one Time more than another, by a Weight of *Air* equal to the Weight of 3 *Cubical* Inches of *Mercury*. Now a *Cubical* Foot of Water being 76 Pounds, a *Cubical* Foot of *Mercury* muſt be 1064 Pounds equal to 102144 Drams. And as 102144 Drams is to a *Cubical* Foot, or which is all one, 1728 *Cubical* Inches : : $59\frac{192}{1728}$ Drams to one *Cubical* Inch. So that a *Cubical* Inch of *Mercury* (throwing away the Fraction which is inconſiderable) is equal to 59 Drams, and there being 144 ſquare Inches in a Foot ſquare, therefore a Maſs of *Mercury* of a Foot ſquare *Baſe* = to 144 ſquare Inches, and 3 Inches high, muſt contain 432 *Cubical* Inches of *Mercury*, which being multiplied by 59 (the Number of Drams in a *Cubical* Inch of *Mercury*) makes 25488 Drams, and this Weight does a Foot ſquare of the Surface of our Bodies ſuſtain at one Time more than another. Suppoſe again, the *Superficies* of a Humane Body equal to 15 ſquare Feet, then wou'd the Body ſuſtain at one Time more than another, a Weight

$$= 15 \times 25488 = \frac{382320 \text{ Drams}}{8} \left(= \frac{47790 \text{ Ounces}}{12}\right) = 3982\tfrac{1}{2} \text{ Pounds } \textit{Troy}.$$

§ 12. Now it is ſo far from being a Wonder that we ſometimes ſuffer in our Health by a Change of Weather, that 'tis the greateſt, we don't always ſo; for when we conſider that our Bodies are ſometimes preſs'd upon by near a Ton and half Weight more than at another, and that this Variation is often very ſudden; 'tis ſurpriſing, that every ſuch Change ſhou'd not entirely break the Frame of our Bodies to pieces, and be the conſtant Harbinger of ſudden Death. One wou'd think that when ſo many of the Veſſels of our Bodies are ſtraitned by an increaſed Preſſure, that the Blood wou'd ſtagnate up to the very Heart, which not being able to contract itſelf, the Circulation wou'd ceaſe, and we ſhou'd die. But ſuch is the Contrivance of infinite Wiſdom, that when the Reſiſtance to the circulating Blood is greateſt, the *Impetus* by which the Heart contracts ſhould be ſo too: The Weight of the *Air* increaſing, the *Lungs* will be more forcibly expanded, and hereby the Blood more intimately broken and divided, ſo that it becomes fitter for the moſt fluid Secretions, ſuch as that of *Animal Spirits*, by which the Heart will be more ſtrongly contracted. The

Blood's Motion towards the Surface of the Body being obſtructed, it will paſs in greater Quantity to the *Brain*, where the Preſſure of the *Air* is taken off by the *Cranium*: And upon this Score more Spirits will be ſeparated, whereby the Heart will be ſo ſtrongly contracted, as to carry on the *Circulation* thro' the paſſable *Canals*, whilſt ſome other are obſtructed.

§ 13. There will be one conſiderable Alteration made in the Blood, upon the *Air*'s greater or leſs Preſſure on the *Surface* of our Bodies, *viz.* the Blood will be more or leſs compact; will be crowded into a leſs, or poſſeſs a greater Space in the Veſſels it runs in. For the *Air* contain'd in the Blood, always keeps itſelf in *Æquilibrio* with the External Air that preſſes upon our Bodies; and this it does by a conſtant *Niſus* to unbend itſelf, which is always porportional to the compreſſing Weight by which it is bent: So that if the Compreſſion or Weight of the *circum-ambient Air* be never ſo little abated, the *Air* contain'd within the Blood unfolds its Spring, and forces the Blood to take up a larger Space than it had before; for which Reaſon the Blood will be *rarified* into twice its Dimenſions in the *exhauſted Receiver*;

and its only this Way the Operation of *Cupping Glaſſes* can be explain'd.

§ 14. The Alteration happens to *Vegetables*, and *Fermenting Liquors*, as well as to *Animals*. How conſiderable Changes are made by Heat, Cold, or great Winds, in *Fermenting Liquors*, is the Obſervation of every Body converſant with them. Now all theſe Changes are brought about, by altering, either the Gravity or Spring of the *Air*.

§ 15. And it's for this Reaſon that ſome People, by their *Pains*, can foretel any conſiderable Change of the Seaſon, their Blood being more rarified againſt wet Weather, or high Winds, will more forcibly preſs the ſenſible Membranes, whereby *Pains* will be felt, they were free from before.

And this will the rather happen, becauſe the Blood (how apparent the contray may ſeem) will hereby become never a whit the more *Fluxil*; for *Froth*, which is Water blown into Bubbles by *Air*, is leſs *Fluxil* than Water itſelf; and the *Globules* of Blood being blown larger by the contain'd *Air* when the external Preſſure is remov'd, is render'd leſs Fluid, and will paſs the ſmall *Capillaries* with greater Difficulty.

A Fluid muſt have its Parts ſmall, ſmooth ſpherical or approaching thereto, and of equal Denſity, if the Fluid be *Homogeneal* by the 142 *Prop.* of *Borelli de Motibus a gravitate factis.* It is not neceſſary that the Parts ſhould be in Motion, as Mr. *Boyle* imagins, becauſe its neither apparent that the Parts of all Fluids are ſo, nor that the Parts of ſome Solid Bodies are not ſo. Therefore the Blood in this rarified Condition is rather leſs, than more, Fluxil, and this Condition it will be in, whenever the *Air's* Weight is leſſened, or its Spring weakned.

§ 16. There is no Liquor but what is ſomething Viſcid, that can be blown up into Bubbles, and the more tenacious the Parts of any Fluid are, the fitter it is for this Purpoſe; the Bubbles will be both larger, and more durable. A Mixture of Soap and Water may be blown into *Spheres* of above ſix Inches Diameter, and the Blood conſiſts of Parts not unlike what is in ſuch a Mixture. The Blood hath Watry, Saline, and Oily Parts, as is evident to the Senſes: But that which puts it beyond Diſpute, that the Blood is blown into ſuch little *Spherulæ* (and perhaps in the Manner Dr. *Cheyne* (s) has aſſigned in his *Philoſoph. Princip. of Natural Religion*) is what may be obſerv'd, with a good *Microſcope*, in the Tail of a Fiſh. The *Globules* of Blood being too large to paſs the ſmalleſt Arteries, change their *Spherical* Figure, for one that is *Spheroidal*, and recover their former Figure again, when they come into a wider Channel. Now it is the Property of an *Elaſtic* Body alone, that when its Figure is chang'd, to recover it again: And nothing being *Elaſtic* but *Air*, or what contains *Air* in it, it's plain that thoſe *Globules* muſt be filled with *Air*.

§ 17. From what hath been ſaid, it appears, that whenever the Blood is too *viſcid*, ſo that the Force of *Coheſion* be not greater than that by which the contain'd *Air* endeavours to expand it ſelf, the Perſon will be more ſenſibly affected by Change of Weather; and from hence may be taken better *Indications*, both for the Prevention and Cure of theſe Diſtempers, than from any other *Source* whatever.

(s) *P.* 217, 218, &c.

They who underſtand this *Theory*, will know for what Reaſon, and in what Circumſtances, moderate *Evacuations*, *Exerciſe*, *Steel*, and *Mercury*, are ſo beneficial in this Caſe, and will never uſe one of them, when another is more proper.

It would be the eaſieſt Part of my Undertaking to be Particular in theſe Matters; but that it wou'd increaſe the Bulk of the Book to no Purpoſe; for they, who underſtand not theſe ſhort Hints, will be no better for a more diſtinct Explication.

§ 18. I ſhall now enquire how the *Air* affects us, when 'tis too *Hot*, too *Cold*, too *Moiſt*, or *Dry*, &c.

There is none but who obſerve, what conſiderable Changes are made on the whole Face of Eature, by the Approach, or Receſs, of the Sun's warming and enlivening Influences; the Fields, the Foreſts and the Gardens, put themſelves in Mourning at his *Autumnal* Departure.

Animals of ſeveral Kinds retire to their Dens and Caves, to ſpin out an unactive Life in Sleep and Reſt, till, by his invigorating Warmth, in his *Vernal* Return, he thaws their congealed Juices,

ces, and excites them to an active Life.

§ 19. In the Spring we ſee the Plants peep out of the Earth, Flower, and then Seed; the Trees Bloſſom; and Fructifie, the Birds Chirp and Sing for Joy of the approaching Summer. Whence is all this Life and Vigour, but from the Motion and Heat the Sun communicates?

The Sizy Juices are rarified, and made to mount up the ſlender Tubes of Plants, and expand their Fibres, whereby Vegetation is perform'd; an artificial Heat will do the ſame in *Green-houſes*, which ſhews the Affinity between this and that of the Sun.

§ 20. So that *Heat* hath a Power of rarifying, and putting in Motion the Humors of our Bodies, and, if moderate, of relaxing our ſolid Parts; both which appears by the Swelling and Softneſs of our Skin and Veins, when we are well warm'd by the Fire. On the contrary, when we are cold, our Veins are ſunk, our Skin hard, rough, and contracted; but if the Heat be exceſſive, it will contract as much as Cold. A little Heat which only ſerves to drive the Moiſture out of a *Fiddle-ſtring*, relaxes it; tho'

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a greater Heat ſhrivels it on a Heap. Either *actual* or *potential Cauteries* do the ſame, applied to any Part of our Bodies. Now as *Heat* affects us, by rarifying our Humors, and relaxing our Fibres, ſo it leſſens the Spring of the *Air*, and therefore we don't only Perſpire more (according to (*t*) *Sanctorius*'s Obſervation) in Summer than Winter, but ſometimes more than is conſiſtent with Health and Strength, eſpecially if of a weak and lax Conſtitution. Therefore the *Cold Bath*, the uſe of a *Bruſh*, and moderate *Exerciſe*, in the Morning and Evening, together with *Sub-acid* and *Sub-aſtringent* Food, is moſt proper for ſuch People.

§ 21. It is not enough to know that Hot or Cold *Air* is the Parent of many Diſtempers, ſuch as *Fevers*, *Agues*, *Cholicks*, *Pleuriſies*, *Rheumatiſms*, *Catarrhs*, *Conſumptions*, &c. but alſo after what Manner it operates to their Production; otherwiſe we are as much in the Dark as ever, as to their Cure. And this is only done by applying the known and obvious Properties of Cold

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(*t*) Medicina ſtatica, § 2. *Aphor*. 41.

and Heat, to the various Alterations made in the Body, whence thoſe Diſtempers are denominated.

§ 22. That the *Air*, when too *hot*, eſpecially if Moiſture be join'd with it, diſpoſes to malignant Fevers, is the common Opinion of Phyſicians, both Ancient and Modern; and the Method how *this*, as well as a great many other curious *Phænomena* in Nature are brought about, is clearly accounted for by a late Ingenuous Author (*u*). But if the Heat be exceſſive, tho' without Moiſture, it produces *Diary Fevers*, and ſometimes thoſe which the Ancients call'd *Putrid*: Perſpiration being too great, the Humors muſt remain viſcid and dry, and ſo unfit for Circulation: The Fibres being relaxed alſo by the Expence of Spirits, and the cold Evening ſucceeding, the perſpirable Matter is then retain'd, whereby the Heat is increas'd, together with all other *Feveriſh* Symptoms.

§ 23. *Agues* are *Epidemical* in the *Fens* of *Cambridge-ſhire*, and the *Hundreds* of *Eſſex*, both of them flat, watery Coun-

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(*u*) Dr. Mead's *Eſſays of Poiſons*, p. 161.

tries, which fill the *Air* with Vapours, whereby its *Elaſticity* is weakned, the Fibres of the Body relax'd, and the Pores of the Skin obſtructed.

Upon all theſe Accounts the Blood will be apt to depoſite a ſlimy *Lentor* on the Sides of the Capillary Arteries, and the Orifices of the Glands, as is evident from what hath been ſaid already. But how this *Lentor* produces an *Ague*, will be too tedious to explain here; therefore I ſhall refer to what (*w*) *Bellini* hath writ on that Head; what he hath ſaid being ſo full, that there is little or nothing elſe to be added on that Subject. Now if Coldneſs be added to the Moiſture of the *Air*, it will ſo much the more certainly produce this Diſtemper; for Cold contracts, binds up, and makes the Blood more compact, ſo that its Motion becomes ſlower, and its Viſcidity greater; whereſore a cold and moiſt Conſtitution of the *Air*, beſides *Coughs*, *Diſtillations*, *Pleuriſies* and *Rheumatick Pains*, uſhers in *Agues*, and ſome *Fevers* very near allied to them.

(*w*) De Febribus, *p.* 320, ad 401.

§ 24. We obſerve, that *hectic* and *conſumptive* People are moſt in Danger in very hot or cold Weather: Heat relaxeth all the Veſſels of our Bodies, opens the Pores of the Skin, and increaſeth Perſpiration, in which conſiſts the eſſential Nature of a *Hectic*, (as (*x*) Dr. *Cheyne* hath proved) and by weakening the Spring of the *Air*, diſpoſes the Blood to be more viſcid and dry, and ſo (by (*y*) *Bellini*'s Theory) will increaſe that Diſtemper.

If the Seaſon be exceſſive cold, the *Air*'s Weight and Spring are both increaſed, and the *Tone* of the *Lungs* being much weakned in a *Conſumption*, the *Air-Bladders* muſt be expanded above what is neceſſary, that the Blood may *circulate* through the *Lungs*; and then will it, in ſome Meaſure, be obſtructed in its Paſſage through them, and ſo produce all the *Symptoms* that are the Conſequents of ſuch an Obſtruction, as conſtant *tickling* to *Cough*, *Pleuriſies*, *Inflammation* of the *Lungs*, &c. And beſides this, the Cold, by cloſing the Pores of the Skin, will hinder Perſpi-

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(*x*) *New Theory of Fevers*, p. 129.
(*y*) Bel. de Urin. & Pulſibus, *p.* 320.

ration, and thereby increaſe the Quantity of Blood, which will paſs the *Lungs* yet more difficultly, and, for that Reaſon, will increaſe the recited Symptoms. And it is upon this Account alſo, that the Patient falls into a *Diarrhœa*; the Paſſage of the Serum, through the *cutaneous Glands* being ſtopp'd, it ſolicits thoſe of the *Inteſtines*: But if an Entrance be refus'd here, the *Legs* ſwell, and *aſthmatic* Symptoms increaſe, 'till the Patient die.

§ 25. Beſides the ſenſible Qualities of *Heat* and *Cold*, *Moiſture* and *Drineſs*, it is certain, from undoubted Experiments, that the *Air* is more or leſs ſtock'd with *vegetable*, *mineral*, and *animal* Subſtances: Rain Water contains as much vegetable Matter, as Spring Water does, though not ſo much, as River Water, according to (z) Dr. *Woodward*'s Obſervations on *Vegetation*. *Colcothar* will, by being expos'd to the *Air*, turn into a *Vitriol*: The *Caput Mortuum* of Sea-Salt will, after being expos'd to the *Air* for ſome Time, afford a conſiderable Quantity of ſuch Spirits, as were diſtill'd from it before; (as Mr. *Seignette* told (*a*) *Lemery*) what becomes of the Matter we daily perſpire? Certainly 'tis elevated into the *Air* we breathe in, and when a dead Body corrupts, our Noſes will inform us of ſomething *exhaled* from it.

(z) *Philoſoph. Tranſact.* No. 253.

§ 26. And, indeed, it can't but be ſo by the known *Laws of Nature*; for, by what Means ſoever a Body becomes divided, till ſome of its Particles become leſs than the compounding Particles of *Air*, (in a Proportion greater than that, by which the Denſity of one of theſe Particles exceeds the Denſity of a Particle of *Air*) they will be lighter, and ſo be elevated into the *Air*, until, by their *Coalition*, their Gravity be ſo much increaſed, as to ſink them to the Earth again. And we need have Recourſe to no other Cauſe, for the Production of this admirable Effect, even in the moſt hard and ſolid Bodies, than the *Rays* of the *Sun*. Mr. *Romer*, from his Obſervations on the *Eclipſes* of the *Satellites* of *Jupiter*, demonſtrates that Light is not above ten Minutes in paſ-

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(*a*) *Courſe of Chymiſtry*, p. 285.

ſing from the Sun to the Earth. Now, ſince the Earth is at leaſt 10000 of its own Diameters diſtant from the Sun, therefore muſt the Light run 1000 of theſe Diameters in a Minute, which is above a hundred Thouſand Miles in a *Second*; and if a *Bullet*, moving with the ſame Celerity, with which it leaves the Muzzle of the *Cannon*, require 25 Years to paſs from the Earth to the Sun, as *Hugens* has computed it, then will the Velocity of Light, to that of a *Cannon Ball*, be as twenty five Years to ten Minutes, which is above a Million to one: So that the Particles of Light move above a Million of Times ſwifter than a *Cannon Bullet*; and may we not expect proportionable Effects from them, tho' they are ſo exceeding ſmall? For the *Momentum* of any Body in Motion againſt another, is as a *Rectangle* under the Magnitude and Celerity of the moved Body. We may gueſs at the Effects of the *Rays* of Light ſeparately, by what we obſerve, when collected together in the *Focus* of a Burning-Glaſs: For no *Body*, tho' never ſo compact, is able to reſiſt its Force. *Gold* itſelf may be *vitrify'd* by the concenter'd Rays of the Sun, though it be unalterable by any *culinary*

Fire whatever; as Mr. *Blondel* tells us, one Part exhaling, whilſt the other is turned into Glaſs, and this in a few *Seconds* of Time,

§ 27. Now, from what hath been ſaid, it appears, that the Rays of the Sun are not only able to *abrade* and file off from the moſt ſolid Bodies, ſuch ſmall Particles, as, being ſeparated, will become lighter than any the leaſt compounding Particles of Air, but alſo by the Celerity, with which they will be reflected, be enabled to carry into the *Air* ſuch little *Maſſes* of Matter, as are really heavier than the *Air* they mount up in; which, when the Force impreſſed (conſtantly decreaſing) becomes leſs than will impel them higher, they muſt neceſſarily fall down to the Earth again, and ſo muſt variouſly affect our Bodies, both in their Aſcent and Deſcent, according to their various Natures and Properties.

§ 28. The *Moiſture* of the *Air* was very troubleſome and unwholeſome to the firſt *Colonies* in *America*, till their prodigious Woods were, in a great Meaſure, cut down, and their Land cultivated, whereby their *Air* became more *ſerene* and dry; ſo that a woody Country

try muſt be unhealthful for ſuch as are of a *lax* Conſtitution.

The Reaſon of this extraordinary Moiſture in *Wood-land* is eaſily accounted for, from (*b*) Dr. *Woodward*'s Obſervations on Vegetation, which are too tedious to inſert here; I ſhall only take Notice, ‘ That the Water in the Glaſs ‘ that had no Plant in it, continued the ‘ ſame Quantity at the End of the Experiment, as at firſt, tho' a conſiderable Quantity was expended, by riſing ‘ through the ſlender *Tubes* of ſuch ‘ Plants as were in the other Glaſſes, ‘ and that the largeſt thriving Plants ‘ expended the moſt Water; and that, ‘ in ſome Plants, the Expence of the ‘ Water to the Growth of the Plant ‘ was as 700 to 1; there muſt then prodigious Quantities of Moiſture exhale from the numerous Branches of large Trees, and when thoſe Trees are alſo numerous, muſt needs make the *Air foggy*.

§ 39. The *Air* will not only be *moiſt* but partake ſomething of the Nature of thoſe Plants, thro' which the Moiſture exhales, and ſo may become more or

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(*b*) *Philoſoph. Tranſact.* No: 253.

leſs wholeſome on that Account; for we know by Experience, that even fragrant Smells will ſo affect ſome *hyſterical* Women, as to throw them into a *Syncope:* And there is no Conſtitution, which ſome Smell or other will not diſorder; and what a ſtrong Smell will do ſuddenly, a faint one may do in Time. And tho' Cuſtom may abate the Senſe of it, as in *Tallow-Chandlers*, *Leather-Sellers*, and *Tanners*; yet, by Degrees, it will operate effectually, to produce a Change in the Conſtitution, either for the better, or the worſe, according to the different Subjects it hath to work on; and it is from offenſive Smells, among other Things, that Diſtempers are more frequent and dangerous in *Cities*, than the *Country*; and the great Mortality, that is ſo often in *Camps*, is commonly owing to the ſame Cauſe: The Truth of this appears by the Caution given to the *Jews:* (c) *Thou ſhalt have a Place alſo without the Camp, whither thou ſhalt go forth abroad, and thou ſhalt have a Paddle upon thy Weapon, and it ſhall be, when thou wilt eaſe thyſelf abroad, thou ſhalt dig therewith, and ſhalt*

(c) *Deuteronomy*, c. xxiii. v. 12, 13.

turn the Back, and cover that which cometh from thee. It wou'd have been impoſſible for ſo numerous a *Hoſt* to have ſubſiſted ſo long, without all that Care we read of in the Hiſtory of their Paſſage from *Egypt* to the *Holy Land.*

§ 30. The Diſtempers, that rage moſt in *Camps*, are *Dyſenteries* and *malignant Fevers*; and though the Paſſions of the Mind, and bad Diet, have a great Share in producing them, as I may obſerve under their proper Heads, yet nothing contributes more to the Production of ſuch Diſtempers, than the *infected Air* they breathe in, occaſion'd by that Filth, which is the neceſſary Attendant of ſuch a Place, eſpecially in *Sieges*, where the corrupted Particles of dead Bodies, both of Men and Beaſts, fill the Air with an intolerable Stench; beſides, the *Steams* that are raiſed into the *Air*, from the Bodies of Men and other Animals, by Perſpiration, muſt ſo load the *Air*, as mightily to increaſe its Gravity, and the Heat of the *Camp* will alſo weaken its *Spring*; upon both which Accounts it will be unfit for Reſpiration, and thereby the Blood be *unbroken* in the *Lungs*, and ſo diſpoſe to thoſe Diſtempers that proceed from a viſcid Blood; Such are

Agues, *malignant Fevers*, and *Dyſenteries*, as is evident from the *Theory* of theſe Diſtempers.

§ 31. The *Air*, upon the *Sea* being too *ſalt* and *moiſt*, cauſes Diſeaſes in *Seamen*, that we on the Land know little more of, than the Name: Their Diet, which is principally ſalt Meat, together with the Cold they are expos'd to, contribute their Share; but the *Air*, which they conſtantly breathe in, and which mixes itſelf with whatever they eat or drink, and which is always contiguous to their Bodies, muſt needs be a Principal in all their Diſorders.

They are generally very *coſtive*; and (*e*) *Ramazin* obſerves, from *Bartholin*, that they require almoſt double the Doſe of Phyſic to *purge* them, that other People do.

The *Salt* in the *Air*, and alſo in their Meat, *ſhrivels* up the Fibres of their *Guts*, and makes them almoſt inſenſible; and being the Expulſion of the *Fæces* is owing to the *periſtaltic Motion* of the *Guts*, whatever abates that, as ſalt Things will do, it will make the Man *coſtive*,

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(*e*) De Morbis Artificum, *&c.* p. 224.

and will alſo leſſen the Force of a purging Medicine. But the *Scurvy* is that Diſtemper they dread the moſt, and which few of them eſcape; and tho' there are ſo many odd Symptoms, as *red*, *blue*, or *black Spots* on the Legs, *extraordinary Weakneſs*, a *Redneſs* and *Itching*, *rotten Gums*, *ſtinking Breath*, *looſe Teeth*, *unequal Pulſe*, *violent Pains*, &c. yet they are all accountable for, from that Alteration of the Blood, which will be brought about by a *ſalt* and *moiſt Air*. From what I've ſaid above, it will render the Blood more viſcid than in a natural State, and the *Salt* in the *Air*, and eſpecially the *Bittern* in that Salt which they eat, will heat and rarify this viſcid Blood, and ſo increaſe its Celerity, and the *Globules* being greater, will ſtay in the Capillaries, till the Force of the circulating Blood either break them, or remove the Obſtruction; from whence ariſes the *Spots* and *Itching* in the Skin; for *extravaſated* Blood turns *livid*, or *black*; ſome of the *extravaſated* Blood *putrifies*, ſo that the *Gums* rot, and the *Breath* ſtinks; *Pains*, irregular Pulſe, and the other Symptoms, derive their Original from the ſame Source. That *Salt* is a principal Actor in this *Tragedy*, is confirm'd by the Obſervation of (*e*) the aforemention'd Author, on thoſe who work in making Salt. They are almoſt all *Cachectic*, *Hydropical*, with ſordid Ulcers and Scabs upon their Legs, have voracious Appetites, are great Drinkers, and oft die ſuddenly.

§ 32. I might here take Notice of the Influences of the *Planets*, ſince they act only by altering the *Air* as to its Gravity or Spring, or by raiſing *Effluvia* from the Earth, and by their Heat, which is always proportional to their Light, being both as the Squares of their Diſtances, reciprocally, and as the Signs of the Angles of their Incidence. Thoſe who think the *Planets* have no Influence at all, need but to read Dr. *Mead*'s Book *de Imperio Solis & Lunæ*, &c. to be convinc'd of their Error; for he has, from Sir *Iſaac Newton*'s Principles, demonſtrated the Neceſſity of their Influence upon human Bodies, ſo that what heretofore was only Conjecture, is now a demonſtrated Truth.

(*e*) Page 226.

§ 33. We may gueſs at the Effects of *mineral* Particles raiſed into the *Air*, either by the Heat of the Sun, or a *ſubterraneous* Fire, by the Alterations that are made in the Bodies of thoſe who are moſt converſant with them. *Miners*, in general, are ſubject to *Aſthma's*, *Conſumptions*, *Apoplexies*, *Palſies*, *Cachexies*, *ſwell'd Legs*, *Falling out of their Teeth*, *Ulcers of the Gums*, *Pains in the Joints*, and *Tremblings*: In particular, *Lead* gives *Cholics* and *Palſies*.

Copperas, by its Stipticity, being conſtantly applied to the *Aſpera Arteria* in Reſpiration, ſo contracts and ſtraitens the Veſſels, that the *Air* is not able to expand the *Lungs* to ſuch a Degree, that the Blood may circulate freely; for which Reaſon, they who work upon it are, according to common Obſervation, *Aſthmatic*.

§ 34. But of all others, the *Mercury Miners* are liable to the greateſt Inconveniencies. * *Fallopius* tells us, that in four Months Time they begin to tremble, and ſcarce any of them live three Years. They are ſubject to *Palſies*, *Vertigo's* and

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* Tract. de Metal. & Foſſilibus.

Hectics, as appears from the Authority of a great Number of Writers cited by *Ramazini* (*t*).

In order to account for thoſe different Effects of *Mercury* upon Human Bodies, I ſhall premiſe, that it is capable of entring through the Pores of the Skin into the Maſs of Blood, as appears by thoſe who are *Salivated* by *Mercurial Unctions*; as alſo that *Miners* can change the Colour of Gold from Yellow to an obſcure White, by holding it, for ſome Time, in their Mouths: Now *Mercury*, being enter'd into the Maſs of Blood, of ſuch as work daily upon it, muſt wonderfully diſſolve and rarify it; for it being about ten Times as heavy as the Blood, every Particle of it will have ten Times the Force to diſſolve the Blood, that a Particle of Blood of the ſame Magnitude will have: For the *Momentum* of either a Particle of *Mercury*, or Blood, to break thro' any Obſtacle, or overcome any Reſiſtance, is as a *Rectangle* under the Celerity with which it is moved, and the Quantity of Matter contain'd in it, which is meaſur'd by its Weight.

(*t*) De Morbis, *Art.* c. 1, 2, 3, 4.

Now the Celerity being the ſame in both, the *Momentum* muſt be as their Gravities; and the Gravity of *Mercury* to that of Blood, being as ten to one, the *Momentum* of *Mercury* muſt be ten Times as great as that of Blood. But if we conſider how much more ſwiftly the Blood moves in thoſe who have taken *Mercury* (the Pulſe being both quicker and ſtronger) as alſo the Hardneſs and Exility of the Parts of *Mercury*, by which they act as ſo many little *Wedges* in diſſolving the Blood, and removing Obſtructions, we ſhall eaſily believe what Dr. *Cheyne* tells us (*g*). That the Blood, aſſiſted by any conſiderable Quantity of *Mercury*, will be able to do as much, in the removal of Obſtructions, in one Day, as the Blood unaſſiſted in three Years.

The Blood being in this rarified Condition, will ſtretch the Sides of the Arteries beyond their uſual Limits, and ſo the *Carotid* Arteries will preſs upon the *Optick Nerves*, and at every Pulſation of the Arteries, will ſhake the *Optick Nerves* and the ſeveral Branches of

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(*g*) *New Theory of Fevers*, 122.

'em diſpers'd thro' the *Retina*, a little out of their Places; ſo that the ſame Object, tho' at reſt, will every Moment paint its Image upon different Parts of the *Retina*, and therefore ſeem to move upwards or downwards, to the Right or Left, or circularly, according to the various Poſture the *Retina* is put into; for 'tis the ſame Thing to us, whether the Object move, and the *Eye* be ſtill, or the *Eye* move, and the Object be at reſt: We ſhall, in both Caſes, have the ſame Senſation, but in the Latter we are ſaid to be *Vertiginous*; ſo that 'tis no Wonder that *Mercury-Miners* are ſubject to this Diſtemper.

This Extenſion of the Arteries may be *ſuch*, from a greater Rarefaction of the Blood, as ſo to preſs and ſtraiten the contiguous Nerves, that the Paſſage of the Spirits thro' 'em, to the Muſcles, will be either wholly obſtructed, or in part; ſo that there will be either a *trembling Motion*, or none at all.

Beſides this, a *Palſy* is ſometimes cauſed by the Hardneſs and Drineſs of the Nerves; whereby their Cavity is leſſen'd, and the Motion of the Spirits obſtructed; and upon this Account both Senſe and Motion are taken away. From what hath been ſaid, it appears that *Mercury* hath a wonderful Efficacy in removing Obſtructions, making the Blood fluxil, and ſcow'ring the Glands, whereby all Evacuations will be increas'd, and the Body depriv'd of its moſt fluid Parts (*b*); (for in all Secretions the moſt fluid Parts are firſt ſeparated) ſo that the ſolid will become more dry than in a State of Health, which was to be prov'd.

There is yet another Reaſon why *Mercury* may, when receiv'd into the Body, in too great a Quantity, produce a *Palſy*: For if in any Artery there be ſo much *Mercury* amaſs'd together, that its Weight be able to reſiſt the Force of the circulating Blood, ſo that the *Muſcle* in which that Artery terminates, having its due Supply of Blood cut off, will loſe its Motion. Any one may be ſatisfied of the Truth of this, by making a Ligature upon the deſcending Trunk of the great Artery of a Dog, for he will find him incapable of moving his hinder Parts. The ſame Thing may happen in the Nerves, whereby

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(*b*) *By the 3d Propoſition of* Animal Secretion.

the Spirits are obſtructed, ſo that we ſee, upon ſeveral Accounts, that *Mercury* may produce a *Palſy*.

But how it ſhou'd cauſe a *Hectic*, will not be ſo eaſily accounted for by thoſe who ſubſcribe to the common Theory. For *Mercury* is fitter to cure, than to cauſe, a *Hectic*, if owing to the Cauſes generally aſſign'd (*i*). *Etmuller* tells us, 'That the immediate Cauſe of a *Hectic*, 'is the Indiſpoſition and unequal Tex-'ture of the Blood, caus'd by the ſalt-'iſh Sharpneſs of the Lympha in the 'conglobate Glandules, and the Viſ-'coſcity of that in the Conglomerate, 'from whence inſue a deprav'd and 'diminiſh'd Fermentation, Weakneſs, 'Wearineſs and Deficiency of Spirits, 'and the whole Train of *Hectic* Symp-'toms; the ſaline and viſcid Blood is 'render'd unfit for nouriſhing the Parts, 'and after Eating, when the thin Parts of 'the Chyle dilutes the Blood, and diſen-'gages the Salts, the Pulſe is a little en-'larg'd, and the Heat augmented, and 'after ſome Time, ſink again to the or-'dinary Pitch; and the coarſe Remains

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(*i*) Oper. Medica. *cap* de Febre Hectica.

‘ of the Chyle are frequently voided ‘ by Night-Sweats, as having receiv’d ‘ a vicious Tincture from the Saliva in ‘ the Stomach’. What the Author means by an unequal Texture of Blood, will never be underſtood by thoſe who know that the Texture of the Blood is never equal, even in a State of perfect Health, that is, its Parts are never ſimilar and of equal Denſity; but could we conceive this unequal Texture of the Blood, and that which is ſtill as difficult to underſtand, how the ſaltiſh Sharpneſs of the *Lympha* in the *conglobate Glandules*, and the Viſcocity of that in the *Conglomerate*, can be the Cauſe of it, yet we know nothing fitter to blunt the Edges of ſharp Salts, and remove the Viſcoſity of any Fluid in the Body, than *Mercury*; and therefore inſtead of cauſing, ſhou’d cure a *Hectic*. So that we muſt either quit the common Theory, or deny that *Mercury* can cauſe a *Hectic*; but ſince the Fact is certain, let’s try how we can Account for it. From what hath been ſaid before, it appears that *Mercury* will wonderfully enlarge the Orifices of all the Glands of the Body; and by ſpending the Spirits in exceſſive Perſpiration, will make an univerſal Relaxation of all the

Fibres in the Body, and the Diameter of Veſſels will be hereby inlarg'd, and the Quantity of Blood mightily diminiſh'd, and the Strength greatly impair'd; for the Strength of an *Animal* is in triplicate Proportion to the Quantity of his Blood, &c. if the Reader underſtand but Dr. *Cheyne's Theory of a Hectic*, he can't but clearly ſee how *Mercury* may be the Cauſe of it.

§ 35. By thoſe few Inſtances we ſee what vaſt Alterations may be made in the Conſtitution of an Animal, by the Operation of *Mineral* Particles, when by any Means admitted into the Maſs of Blood, as they will be more or leſs, in Proportion to the Number of them floating in the *Air*: So that a Phyſician can't better ſpend his Time for the Profit of his Patient, than ſtudy the Conſtitution of the *Air* in which he breathes, it being the Parent of ſo many Diſtempers. In *London* People are *Coſtive*, *Aſthmatic*, *Hyſteric*, and *Hypochondraic*, as alſo ſubject to Fevers of ſeveral Kinds: The like I have obſerv'd at *Sheffield*, a great Manufactory for Knives, and all other Sorts of Iron Ware; which occaſions the burning a prodigious Number of Coals, which, by their ſulphurous Vapours, will neceſſarily diſpoſe to thoſe Diſeaſes.

And were we to conſider the various Conſtitutions of the *Air* in the ſeveral Seaſons of the Year, in Imitation of the great *Hippocrates*, or that nice Obſerver, our own Country-Man, Dr. *Sydenham*, we ſhou'd be able to foretel future Diſtempers with ſuch Exactneſs, as would raiſe the Admiration of all that heard us, and might give Occaſion to make uſe of ſuch Things as are proper to prevent 'em, and ſo far aſſiſt us in diſcovering their Nature, as mightily to facilitate their Cure.

(*k*) *Hippocrates* tells us, That the Change of the Seaſons is the principal Parent of Diſeaſes, and no Wonder that it ſhould be ſo, ſeeing the different Spring, Weight, Heat, Cold, Moiſture, &c. of the *Air*, are able to make ſo great Alterations in a Human Body, as I have fully proved they are. I had thought here to have *commented* upon ſeveral of *Hipprocates Aphoriſms*

(*k*) *Aphor*. 1. § 1.

in § 3. about the *Air*; but conſidering the vaſt Difference of the Climate, where he lived, from ours, I concluded that many of his Obſervations would be uſeleſs to us, as I found, by examining, they were; therefore I rather chuſe to give an Account of the various Conſtitutions of the *Air* in *London*, taken Notice of by that ſagacious and indefatigable Searcher into Natural *Phænomena*, Dr. *Thomas Sydenham*, for 14 Years together, *viz.* from the Year 1661, to the Year 1675.

An Abſtract of Dr. Sydenham's *Hiſtory of* Epidemick Conſtitutions *of the* Air.

§ 1. HE tells us, That from the Year 1661, to the Year 65, the *Depuratory* and *Intermitting* Fevers of all kinds, were *Epidemical.*

§ 2. In the *Depuratory* Fever, beſides the Common Symptoms of other Fevers, he obſerv'd that the ſick Perſon is very Faint, Vomits, or enclines thereto, the Tongue is black and dry, there is a ſudden Proſtration of Strength, the external Parts are dry, the Urine is thick, or thin, each a Sign of Crudity; in the Declenſion a *Diarrhœa* happens, (unleſs it be prevented in the Beginning) which protracts the Diſeaſe, but of its own Nature, it terminates in 14 or 21 Days, with a gentle Sweat. Other Symptoms happen upon irregular Practice.

§ 3. He begins the Cure with *Phlebotomy* in *Plethorick* Conſtitutions, which he repeats or omits, and gives Cordials more liberally or ſparingly, and looſens or binds the Belly, as the greater or leſs Commotion of the Blood indicates; after *Venæſection*) if it be neceſſary) if the Patient *Vomit*, or have a *Nauſea* at his Stomach, he preſcribes a Vomit, and an Opiat at Night after it, by which Means a *Diarrhœa* is prevented; ſo certain is this, that if a *Diarrhœa* happen in the Declenſion, you may be ſure there was either a *Nauſea* or Vomiting in the Beginning and no Vomit given. He adventures to Vomit them in any *Stadium* of the Diſtemper, if a preſent *Diarrhœa* and *Nauſea* indicate it.

In the *Autumn*, *Bleeding* and *Coolers* are not ſo ſafe, but a Vomit is neceſſary, after a laudable Sediment in the Urine, ſhews the Fever to have left the Patient, which commonly happens on the fourteenth Day, if Nature be not diſturb'd by too cooling a Method; in which Caſe it falls out about the twenty-firſt Day; a Purge is to be adminiſtred: Till then he is to lie in Bed. Sometimes, eſpecially in old Men, a Cough, with ſpitting much tough Matter, ſucceeds a Fever, which is cured by moderate drinking of generous Wines. *Opiats* ought not to be given till the End of the Fever, and after Purging, if poſſible.

§ 4. Here we have a moſt accurate Hiſtory of this Fever, with all its diſtinguiſhing Characteriſticks, and a Method of Cure, eſtabliſh'd upon a long *Series* of Experiments; and how rational it is, will, in part, appear, by what I have already ſaid of Fevers, and be farther illuſtrated by what I am about to ſay. Faintneſs, Proſtration of Strength, Dryneſs of the Tongue and Skin, are accounted for before: I ſhall now ſhew, that when the Blood is in too great an Agitation, (which is all our Author means by Crudity,) the *Urine* will be clear and thin, or thick and muddy. Perſpiration will be ſtop'd, the Skin being dry, and the ſaline Parts of the Blood, which uſed to be evacuated that

Way, will be retain'd among the *Serum*, which, together with the greater Heat, will ſtimulate the *Kidneys*, whereby they will be ſo contracted, as to let out nothing but the moſt thin Part of the *Serum*. And ſo violent may the Motion of the Blood be, as to break ſome of the ſolid Parts into ſuch ſmall Particles as will, with the *Serum*, paſs the *Kidneys*, (eſpecially if by any Means their Fibres be in the leaſt weakned and relax'd) and after they are ſeparated from the Body, ſo obſtruct the Rays of Light from paſſing directly through the *Urine*, as will make it appear thick and turbid; and beſides this, the *Urine* will be leſs fluxil upon the Account of this Mixture, for the Viſcidity of Liquors is owing to the Quantity and Figure of the Solids which ſwim in them, and the different Degrees of *Attraction* thoſe Solids have among themſelves.

§ 5. The Reaſon why a *Diarrhœa* happens in the Declenſion, when no Vomit hath been given in the Beginning, and why a Vomit prevents it, is, becauſe a *ſtimulating* Matter lying in the Stomach for ſome Time, as it cauſes *Nauſea*'s and vomiting whilſt it remains there; ſo after it is protruded into the *Guts*, as it ſometimes will be, will act its part there, and cauſe a Purging: But on the contrary, this Matter being evacuated by a timely Vomit, and the Stomach regaining its Tone again, is better enabl'd to perform its Office, whereby the generating of ſuch Matter is prevented. There are ſeveral other Advantages accruing to the Patient by this means, as you may ſee in (*l*) Dr. *Cheyne*'s *New Theory of Fevers*, yet I have frequently obſerv'd the Patient much worſe upon taking a *Vomit*; for Vomiting is not always to be cured by a Vomit, but ſometimes by ſuch things as moiſten, ſoften and relax the too tenſe and irritated Fibres of the Stomach: Beſides, there are ſome of ſo delicate Conſtitutions, as are not able to bear ſuch violent Commotions without the greateſt Hazard: Which therefore put me upon contriving another Method leſs obnoxious to thoſe Inconveniences, and that at laſt I hit upon; for by a proper Management of gentle cooling Purgatives, of which there are ſome very agreeable to the Stomach of ſuch as are in a Fever, all is done that is

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(*l*) *Page* 72.

expected from a Vomit (except the Effects of a violent Contraction of the Muſcles of the *Abdomen* and *Diaphragma*) both with more Eaſe and Safety. *Vomitting* is more neceſſary in the *Autumn* than the *Spring*, according to our Author's Obſervation; for in that Seaſon of the Year, the Humors of our Bodies are more Viſcid, and the Veſſels, in which they circulate, more lax and yielding, upon both which Accounts, Vomiting is more proper. And it is upon this Account that *Bleeding*, and too cool a *Regimen*, is ſo dangerous in this Seaſon.

Tho' I have been very ſhort in my Reaſonings, upon this Fever, yet I have exceeded my own Deſign; therefore reſolve to be more brief upon the Other.

§ 6. The *Intermitting Fevers* of this Conſtitution he reduces to *Vernal* and *Autumnal*; the *Vernal* generally begin in *February*, the *Autumnal* in *Auguſt*; the *Vernal* are *Quotidian*, or *Tertian*, and are ſhort and wholſome, except they be protracted by unneceſſary Bleeding or Purging.

The *Autumnal* are *Tertian* or *Quartan*, the firſt not ſo dangerous, often leaves them,

them about the Winter *Solſtice*, the other is more dangerous, which often produces the Scurvy, Inflammation of the Tonſils, hard Bellies, and the Dropſy; the Young ſometimes get quit of it in *December*, but oftentimes not till *March*, and if Bleeding and Purging have weakned 'em, then not till next *Autumn*: It's more dangerous to the Aged.

Thoſe who have had a *Quartan*, if they have it a ſecond Time, it laſts not over two or three Paroxyſms.

The *Vernal* are to be left to Nature, for they never kill. He found Vomiting good before the Paroxyſms, and Sweating after them.

The *Autumnal* are more difficultly cured. If the Conſtitution be *epidemical*, the Adult are ſeiz'd in *June*; if not, in *Auguſt*, and the Beginning of *September*, they rather remit than intermit, for the firſt Days.

§ 7. The Author thinks there is a great Affinity between theſe Fevers and the *depuratory*; for he obſerves, that ordinarily the *Depuration* of the Blood is perform'd in 336 Hours, and if we reckon five Hours and a half for a Paroxyſm, in intermitting Fevers, then ſo many Fits as, at five Hours and a half a-piece, amounts to 336 Hours, will terminate the Diſtemper, if left to Nature, which is agreeable to Obſervation: And for this Reaſon 'tis, that *Tertians* continue longer than *Quotidians*, and *Quartans* than theſe, being longeſt in running the Circuit of three hundred thirty ſix Hours.

§ 8. I ſhall take no further Notice of his Method of Cure, being every Body knows that the *Cortex*, rightly adminiſtred, is a *Specific* in all Kinds of intermitting Diſtempers; I ſay, if rightly adminiſtred, becauſe I have known it often unſucceſsful, when given by an unskilful Hand. In particular, a Tradeſman in *Sheffield*, who was worn almoſt to a *Skeleton*, by a Quartan Ague he got in *Eſſex*, which he had labour'd under for a Year, when I was conſulted: Beſides a great many other Medicines, he had taken above half a Pound of the *Cortex* without any Advantage; and finding his Stomach quite gone, and he conſtantly faint and chill, after I had vomited him with *Vinum Benedictum*, I cured him, by giving him only two Ounces of *Cortex*, with a good Quantity of *Rad. Sepentar. Virginian.* added to it, by which, both its heating Cordial, and diſſolving Properties, were increaſed.

§ 9. The next Conſtitution begun in 65; for after a very cold Winter, and dry Froſt in the Spring, till the End of *March*, which then ended with a ſudden Thaw, in the Year 65, Multitudes died of *Pleuriſies*, *Quinſies*, *Inflammations* of the *Lungs*, and ſuch like Diſtempers; from which Time a continual *epidemical* Fever begun, worſe than the *depuratory*; the Head-ach and Vomiting were more grievous, the *Diarrhœa* was increas'd, not leſſened by a Vomit, and the Vomiting made worſe; the external Parts were dry, yet, after Bleeding, Sweat might eaſily be forc'd, at any Time of the Diſtemper, with ſome Advantage, which could neither eaſily be done in the *depuratory*, nor, if it could, was it without Danger, till the 14th Day. The Blood in this Fever is ſomewhat *pleuritic* or ſizy.

§ 10. The Blood being made very ſuſceptible of Motion, and ſpirituous, by the preceding froſty dry Weather, and the Fibres of the Body being relaxed, and the Pores obſtructed by the ſudden Thaw, do certainly diſpoſe to the Diſtempers above recited: The Truth of this is deducible from what I have ſaid in ſeveral Parts of this Book, ſo ſhall not trouble the Reader with my Reaſons here. Vomiting is improper in this Fever, for the ſame Cauſe I have rejected it in the *depuratory*, the Inflammation being greater, and the Motion of the Blood ſwifter, the Tenſity of the Fibres are ſuch, as not to bear the leaſt Irritation, for which Reaſon, Bleeding, and gentle Sudorifics, muſt be uſeful: But 'tis beſt, for the ſame Reaſon, to force Sweat by Liquors actually hot, together with the Weight of Bed-cloaths, rather than by the *Alexipharmics* commonly preſcrib'd.

§ 11. After this began the *Peſt*, which increaſed till the *autumnal Equinox* in the Year 66, when it deſtroyed about 8000 in a Week; from thence it abated till the Winter-Cold almoſt vanquiſh'd it: In the Spring it quite ceaſed. The former Fever remain'd (tho' not ſo epidemical) till the Beginning of the Year 67.

§ 12. At which Time the third Conſtitution begun with the *Small Pox*, which increaſed till *Autumn*, and then were *epidemical*, and from thence decreas'd creas'd ſtill the next Spring, (*viz.*) 68, when they begun to rage violently, and continued till froſty Weather next Winter, which abated them; then, in the Spring 69, they appear'd again, tho' not ſo univerſally as before, and leſſen'd, till *Auguſt* 69, when they gave Place to an *epidemical* Dyſentery.

§ 13. A Fever, which the Doctor calls *Febris Varioloſa*, begun, when the ſmall *Pox* begun, in 67, and ended with them in 69, it had all the Symptoms of the Small Pox, ſave thoſe that attend the Eruption, Maturation, &c. of the *Puſtules.* The Signs are, a Pain on the Heart-pit, eſpecially if preſſed, Pain in the Head, and Heat of the whole Body, with purple Spots, not very thirſty, the Tongue and Urine natural in the Beginning, except that the Tongue be ſometimes white, ſeldom dry, and never black, a *Phrenſy* and Encreaſe of the Spots from a hot *Regimen.* There are ſymptomatic Sweats in the Beginning; irregular Practice protracts the Fever to five or ſix Weeks, if Death prevent not. Critical *Salivation* towards the End terminates the Diſtemper, if cooling Medicines have been given, and neither violent Sweats, nor Purging prevented it.

§ 14. Where the Strength will bear it, he begins with Bleeding, which he repeats every other Day, and gives a Clyſter on thoſe Days he does not order Bleeding, and cooling Julaps, with Whey, or Barley Water, *ad libitum:* The Patient muſt riſe out of Bed every Day, notwithſtanding he ſweats: A *ſymptomatic Diarrhœa* is beſt cured by *Venæſection* and Coolers. After the *Salivation* is begun, no Evacuation is proper.

§ 15. A *Diarrhœa*, ſuppos'd to be the variolous Fever turned upon the Guts, and of great Affinity to it, raged all Summer in the Year 69: It was made worſe by *Purging* and *Aſtringents*, but cured by the ſame Method with the Fever, (*viz.*) by Bleeding and Coolers. I ſhall only obſerve here, that moſt Diſtempers have ſome Affinity with the general ones of every Conſtitution; which gives an uſeful Hint to direct us in their Cure, with greater Certainty, and better Succeſs, than otherwiſe we could expect.

§ 16. This *Diarrhœa*, which begun the 4th Conſtitution, was ſucceeded by the forementión'd *Dyſentery*, and, in the

Beginning of *Auguſt* 69, the *Cholera Morbus* was more *epidemical*, than ever he (our Author) ſaw it, which yet laſted but till the Beginning of *September*, no more than it does other Years, when it is *epidemical*, tho', from evident Cauſes, it happens at any Time of the Year.

§ 17. About the End of *Autumn*, *Tormina* without Purging, or the dry Gripes begun, but ended in Winter; yet the *Dyſentery*, that begun with it, continued very *epidemical*, but in very cold Weather ceaſed.

§ 18. The *anomalous Small Pox* begun in *January* 16$\frac{69}{70}$, as the *Dyſenteric* Fever did the *Auguſt* before, which continued all the *dyſenteric* Conſtitution, which ended in 72.

§ 19. The *anomalous* Small Pox begun in *January* 69, and continued to the End of the *dyſenteric* Conſtitution in 72. They gave Place to the *Dyſentery* always in *Autumn*, and the Dyſentery to them in *January*, till the laſt *Autumn*, in which they both raged: Beſides the common Symptoms with the other, they differ'd as follows.

In the *Diſcreet*, when they are very diſtinct, they appear the third Day; in the regular not till the 4th; they are leſs and rougher in theſe, in the Progreſs of the Diſtemper, than in the other; they are oftner black, after they are ripen'd, than the other; ſometimes (tho' ſeldom, if the Puſtules be very few) they ſalivate.

In the *Confluent* they differ in this; ſometimes they ſhew themſelves the ſecond, and ſometimes the third Day, like a reddiſh uniform Tumor, which covers the whole Face, harder than an *Eryſipelas*, without any viſible Diſtance of the Puſtules; the reſt of the Body was cover'd with numberleſs Puſtules join'd together, of a red Colour, and ſometimes, tho' but ſeldom, is there this mortal Symptom, *viz.* little Bladders between the Puſtules of the Thigh fill'd with a limpid *Serum*, which, being broke, runs out, and the Fleſh under them is as black, as if *ſphacilous*. About the 11th Day, a whitiſh *Pellicle* appears upon diverſe Parts of the Face, on that reddiſh Tumor before deſcrib'd: This *Pellicle*, in a little Time, eructates a cruſty ſplendid Matter, of a deep red Colour, like concreet Blood, which, ripening, grows blacker, till the Face be as black as a Coal: The fourteenth, and ſometimes the ſeventeenth, is the *critical* Day in theſe, if over hot *Regimen* kill not the Patient ſooner.

In theſe all the Symptoms are more grievous, the Inflammation is greater, the Puſtules leſs, and more angry, ſcarce diſtinguiſhable from an *Eryſtipelas*, or the *Meaſles*, but by the Times of their Eruption. When the Puſtules fall off, the ſurfuracious Matter ſtays longer, and the Scars are worſe.

§ 20. His Cure, beſides *Hypnotics*, when either Sickneſs, Watching, or *Delirium*, indicate (which muſt only be given to the Adult, in the Diſtinct) a more cooling Method muſt be uſed, in Proportion to the Inflammation, which when greater, drink plentifully of the *white Decoction* made very thin, or Milk and Water, both which promote the Salivation; and tho' the *Menſes* ſhould flow, yet let the Patient drink plentifully.

§ 21. The *dyſenteric* Fever begun in *Autumn* 69, and continued during the *dyſenteric* Conſtitution. This Fever ſeiz'd thoſe who had no *Dyſentery*, only ſometimes they had ſlight Pains, either with or without Stools. It had all the Dyſenteric Symptoms, except Purging, and its Conſequents; in the firſt Year of this Conſtitution, there were ſome gentle Pains, but after that ſcarce any: They ſweat very little, or none at all, but the Pain of the Head is greater in this than in the *Variolouſe*; tho' the Tongue, as in the *Variolouſe*, be moiſt, and white, yet hath it alſo a white *Pellicle* over it: It ſeldom terminates by Salivation, as the other doth. In the Declenſion, the Patient is more troubled with *Apthæ*, than in any other Fever, eſpecially after a hot *Regimen*; if Sweat be forced in the Beginning, it cauſeth a *Coma*.

§ 22. The Cure is, by bleeding and purging every other Day, for ſeveral Times, without Opiats after them: Uſe a ſlender Diet. After the ſecond Purging the Patient may eat Chickens, and the three Days after the laſt Purge, if the Patient be very weak, as *Hyſterical* Women generally are, a gentle Opiat mightily recruits, but does Hurt before.

§ 23. The regular *Meaſles* begun in *January*, 167½, increaſed till *March* the Tenth, then decreaſed till *July*, when they quite diſappeared. The *Small Pox* abated in *Auguſt* 71, and the *Dyſentery* returned more violently than before, but in the Winter gave Place to the *Dyſenteric* Fever, and Small Pox again, which raged all Winter. (*February* is the common *Epocha* of Vernal Fevers, as *July* is of the *Autumnal*) in the Beginning of *February* a *Tertian* took place, tho' not very *Epidemical*, the other Fevers abated, and the *Tertian* vaniſh'd about the Summer Solſtice, as the Vernal *Tertians* commonly do. In *July* 72, the Dyſenterick Fever begun again, tho' milder in the latter End of *Autumn*, when the *Dyſentery* return'd, which gave place again in Winter to the Dyſenteric Fever, and the Small Pox; when I ſay one gave Place to another, I only mean they were not ſo *Epidemical*; for each Diſtemper generally invades ſome, throughout the whole Conſtitution.

§ 24. Through this Conſtitution the *Dyſenteric* Fever begun in *July*, the *Dyſentery* was *Autumnal*, the Small Pox begun in *January*, the *Dyſenteric* Fever abated, and the Small Pox continued till *July*, when the *Dyſenteric* Fever begun again.

§ 25. The fifth Conſtitution takes Place from the Beginning of *July* 73. In the Beginning of this Conſtitution the Fever gave greater Signs of a more Spirituous ritous Inflammation, (as moſt *Epidemical* Diſtempers do) than it did afterwards; for at its Beginning, as alſo the Spring after, there were Signs of a *Pleuriſy*, the Blood was Pleuritick the firſt or ſecond Time the Vein was open'd.

Beſides the Symptons common to all Fevers, there are theſe eſpecially in this, *viz.* violent Pains in the Head and Back, a *Stupor* and Pain in the Joints, a tenſive Pain in the Limbs, and even the whole Body, but leſs than in a Rheumatiſm; for the firſt Days, Cold and Heat ſucceed each other: Sometime in the Beginning of the Diſtemper they ſweat a little; when the Fever is left to it ſelf, the Tongue is moiſt and whitiſh, and ſcarce any Thirſt; the *Urine* almoſt natural, but if the Patient be heated too much, the Tongue is dry, and of a Colour between Brown and Yellow; a great Thirſt, and the Urine very red; if it be rightly treated, it ends in 14 Days, if otherwiſe, then not till the 21ſt. Sometimes the Patient hath a *Coma*, which laſts two or three Weeks, and then he recovers not till the 28th or 30th Day. The firſt Sign of it is the Deſire of ſome abſurd or unaccuſtomed Meat, which may be granted him in a little Quantity.

Sometimes the Head nods, this and that Way, by Reaſon of Weakneſs; faint Sweats which ſucceed the Fever, may be cured by generous Wine. A Dyſentery, and Diarrhœa, in Autumn, 75, ſucceeded, which was nothing elſe but this Fever thrown upon the Guts.

§ 26. The firſt Thing in the Cure is to let Blood, then apply a *Veſicatory*, and after that give a Clyſter every Day, and uſe a cold *Regimen*: After the 14th Day leave 'em to Nature, give ſmall Beer *ad libitum*, and if there be a *Phrenzic*, drop *Spirit* of *Vitriol* into it.

§ 27. This Fever was not very *Epidemical* till *July*, in the Year 75, neither were the forementioned Fever, nor the Small Pox, that begun in 70, quite excluded in 73, tho' the Symptoms of the Latter were much milder, there were yet, *viz.* in 73, a few in the Dyſentery; the Small Pox kept Pace with the Fever, I laſt deſcrib'd, all Winter, but neither very *Epidemical*. In *Chriſtmas*, being very warm after a hard Froſt, there were ſome Dyſenteries which then quite ceas'd.

§ 28. In *January* 167$\frac{3}{4}$, the *anomalous Meaſles* begun and increas'd till *March*, and ceaſed in *June*. They were very *Epide-*

Epidemical, the *Febris Morbilloſa* bore the ſame Date, and had the ſame Period. At the ſame Time begun the *Black Small Pox*, which raged more or leſs, till about *June* 75.

The *anomalous Meaſles*, as they were very *Epidemical*, ſo were they Mortal, if wrong treated; the Eruption happened ſometimes ſooner, and ſometimes later than the Fourth; the Puſtules in theſe Firſt occupied the Shoulders and Trunk, in the other, *viz.* the Regular, the Face, the branny Scales which defile the *Cuticle* in the End of the Diſtemper, in the other, rarely happen in theſe, the Fever and *Dypſnœa*, in the End of the Diſeaſe, are more vehement, and liker to a *Peripneumonia* in theſe, than in the other.

§ 29. The Cure. Put them to Bed two Days before the Eruption, with their uſual Covering, give them Oat, or Barly Grewel, roaſted Apples, ſmall Beer, Milk and Water, and a Pectoral Ptiſan.

§ 30. The *Febris Morbilloſa* differ'd from the Meaſles, in that the Puſtules which imitated the Meaſles were few, and broke out on the Back of the Neck and Shoulders, and ſome on the Trunk;

the Fever is of the ſame Kind with the Meaſles, but more vehement, and ſometimes continued 14 Days or more. Bleeding and Cliſters do harm; it is cured like the Meaſles of the ſame Conſtitution.

§ 31. The Black Small Pox, which begun *January* 167³. The Confluent were of a fuſcous Colour whilſt unripe, but black when ripe; they differ but in few Things from the *Anomalous*, in 69, they are more putrid, and ſmell worſe: When ripe their Matter is more groſs, and more difficultly digeſted. This is worth remarking, that by how much the milder the Small Pox are, by ſo much ſooner the Puſtules ripen; for in the regular Confluent, the Patient was paſt Danger the 12th Day, in the Anomalous Confluent in 70, they were paſt Danger the 15th, or 17th Day; but in theſe they often die after the 20th Day; and ſometimes, if they recover (which rarely happens) the Legs not only ſwell, (as they commonly do in all the confluent Kind) but the Arms, Shoulders, Thighs, and other Parts, with intolerable *Rheumatick* Pains, which ſometimes end in *Impoſtumations* of the Muſculous Parts, by which the Life is in Danger after the Pox hath left them. Theſe Pox are almoſt as fatal as the Peſt.

§ 32. The Cure. A hot *Regimen* increaſeth the Fever, and cauſeth a *Pleuriſy* and Purple Spots; too cold a *Regimen* hinders the Swelling of the Face and Hands, and prevents the Plumping of the Puſtule, which are all neceſſary. Moſt dy'd that us'd the Method formerly preſcrib'd, but not with the following, *viz.* after the 5th or 6th Day, the Patient muſt drink plentifully of ſmall Beer, with *Spirits* of *Vitriol* in it to the End of the Diſtemper, eſpecially at the Maturation of the Puſtules when the Fever is higheſt. The Adult muſt have *Laudanum* every Night after the Eruption; a Glaſs of Sack may be given towards the End of the Diſtemper, if the Faintneſs of the Patient require it.

§ 33. After a very warm Seaſon, which continu'd to the End of *October* 75, ſudden cold and moiſt Weather ſucceeded, which occaſion'd the moſt *Epidemical Cough* that ever our Author obſerv'd, which ended in a Fever, like that in 73, and counterfeited a *Pleuriſy*, and *Peripneumonia*; there was Pain in the

Head, Back and Limbs; it abides not the Bleeding that a true *Pleuriſy* doth.

§ 34. The Cure. When there is nothing but a Cough, a cooling Diet without fleſh Meat, and ſtrong Drink, is ſufficient. If the Fever be begun, bleed, apply a bliſtering Plaiſter to the Neck: Give every Day a Clyſter; keep not too cloſe in Bed; bleed again the third Day, if the Pain abate not, and continue Clyſters, but not to *Hyſteric* and *Hypochondrical* Perſons; and, if extraordinary Heat requires it, bleed again.

§ 35. I had not been at ſo much Pains to contract and methodize the Doctor's Hiſtory of theſe Diſtempers, but that it is the moſt exact of any extant, and done by one on whoſe Integrity we may depend, and to render it more uſeful by the ſucceeding Corollaries. It is not enough to read ſuch a Hiſtory, tho' never ſo true and critical, the Memory being not able to retain the tenth Part, of it, even tho' it were contracted; but we muſt carefully conſider each Part ſeparately, and ſo compare one Part of the Hiſtory with another, as to draw general Concluſions from them, which being but few in Number, are eaſily remembred, and ſo will become uſeful in Practice.

ctice. And if every one that is capable wou'd contribute his Share to ſo beneficial an Undertaking, we might, in a little Time, be furniſh'd with *Maxims* to direct us in a more ſucceſsful Practice, than what is known at preſent.

Corollaries from the preceeding Hiſtory.

I.

Different Conſtitutions of the *Air* the Cauſe of different Diſtempers, and thoſe Diſtempers are generally ſtated and regular, as appears from the Hiſtory in general.

II.

The Diſtempers of each Conſtitution having an Affinity to each other, tho' they differ in ſeveral Reſpects, yet require ſomething common in their Cure, as proceeding from a common Cauſe: So that he who is able to Cure one *Epidemical* Diſtemper in any Conſtitution, hath an Advantage in the Cure of all the other. By § 7, 13, 15, 18, 21, and 30.

III.

Intermitting Fevers, and ſuch continual ones as are allied to 'em, are protracted by a cold *Regimen*. By § 3, and § 6. compared with § 7.

IV.

To know how *Specifics* operate in the Cure of Diſtempers, is not only uſeful to the right adminiſtring of 'em, but alſo ſhews us how to improve their Virtues. By § 8.

V.

Cold, froſty Weather often puts an End to *epidemical* Diſtempers, ſuch as the *Plague*, *Small Pox* and *Dyſentery*. By § 11, 12, 17.

VI.

A hot *Regimen* pernicious in the *Small Pox*, *dyſenteric Fever*, and in moſt continued ones, the worſt Symptoms are owing to it. By § 13, 19, 21, 25, and 32.

VII.

There is a Conſent between the Skin and the Inteſtines according to *Baglivi's* Obſervation. By § 19, 23, and 24.

VIII.

Plenty of cooling Liquors proper in the *Small Pox* and *Inflammatory Fevers.* By § 20, 26, and 32.

IX.

The *Small Pox* and *Meaſles* generally begin in *January.* By § 18, 19, 23, 28, and 31.

X.

A cold and moiſt Conſtitution of the Air diſpoſes to an *epidemical Cough.* By § 33.

XI.

Hypochondriac and *Hyſteric* Perſons are not to be treated like other People in Fevers, they cannot bear ſo large Evacuations. By § 34.

CHAP. VII

Of Bathing.

§ 1. TO what I have writ concerning the *Air*, I ſhall ſubjoin ſome Thoughts of the Nature and Uſe of *Bathing*, by which we are render'd ſometimes more, and ſometimes leſs capable of bearing the Injuries of it, *viz.* the Air, according to the Heat, Temperature, or Coldneſs of the Bath. To which I ſhall annex ſome Obſervations upon, and Directions about wearing of Flannel.

§ 2. Tho' Bathing hath been mightily neglected in the laſt Age, yet it hath been the ancient Practice both of the *Jews* and *Romans*, not only as a Cure of ſeveral Diſtempers, but alſo for Cleanlineſs and Delight. The Uſe of the Bath, eſpecially the Cold, is ſo much reviv'd within this few Years, and the Succeſs of it in the Cure of many Diſtempers being ſo extraordinary, I queſtion not but, in a little time, Bathing will be as much in vogue among us, as heretofore among the Ancients.

§ 3. *Sanctorius* tells us, That Swimming in Cold Water hinders Perſpiration. (*m*) And

That the Flux of the Belly is cured by promoting Perſpiration, (*viz.*) by warm Bathing. (*n*)

That *Hypochondraical* Perſons are much eaſed, if their Bodies be render'd perſpirable by frequent Bathing. (*o*) And

That Waſhing with cold Water heats robuſt Bodies and refrigerates weak ones. (*p*) And

Warm Bathing, unleſs Crudities withſtand, helps Perſpiration, and refrigerates the internal Bowels. (*q*)

Bathing hath been often uſed with Succeſs in the *Scab*, the *Leproſy*, *Elephantiaſis*, and moſt Defædations of the Skin. In Variety of Pains, as *Chronical Rheumatiſms*, *Gout*, *Sciatica*, *Lameneſs*, from either too great Contraction, or Relaxation of the *Tendons*.

(*m*) *Aphor.* 67. § 1.
(*n*) *Aphor.* 92. § 1.
(*o*) *Aphor.* 102. § 1.
(*p*) *Aphor.* 1. § 2.
(*q*) *Aphor.* 2. § 2.

I ſent a Gentlewoman to St. *Mongath's* Well, who was cured of an *Oedematous Tumor* in her Ancle, by Bathing; which wou'd not yield to any Method that had been uſed, as Plaiſters, diſcuſtive Fomentations, with *Sal Armoniac* diſſolv'd in 'em, Tinctures of *Myrrh* and *Camphire*, *Oyl of Tartar*, *per deliquium*, laced Stockins, *&c.* She bath'd her whole Body once a Day, to give a general Contraction and Tenſity to all the Veſſels, and promote a Diſſolution and better Circulation to all the Humors; but bath'd her ſwell'd Leg ſeveral Times every Day, and kept it not too long in the Water at a Time, for fear of chilling it; ſo that the Vibrations of the Fibres being made ſtronger and quicker ſo often in a Day, the obſtructing Matter was remov'd, and the Veſſels enabled to reſiſt the diſtending Power of freſh Humors.

I am perſuaded that a prudent Management of the Cold Bath, wou'd be very powerful in the Relief of *Cachectic* and *Hydropic* People, provided the Diſtempers be not too far advanc'd, and ſome dangerous Symptoms in a *Conſumption*, if the *Lungs* be ſound, would better be remov'd this Way than any other: But this is not to be attempted without the Advice of ſome judicious Phyſician. 'Tis a Specifick in the *Rickets*; *Hæmorrhages*, whether from the Noſe, Guts or *Uterus*, are not only ſtopp'd by cold Bathing, but the Return prevented. Nothing more certainly gives Eaſe and effectually promotes the paſſing of Stones in a *Nephritic* Fit, than warm Bathing. And (*r*) *Baglivi* tells us, That *Dolor Colicus fere ſemper miteſcit in Semicupio.*

Bathing will always act the Part of a *Diuretic.* And plunging over the Head in cold Water, eſpecially in *Sea Water*, will do more in the Cure of Melancholy, Madneſs, and particularly of that occaſioned by the Bite of a mad Dog, than any other Medicine. There is nothing more adapted to the Cure of *Frigidity*, when owing to a former Exceſs of *Venery*, than the Cold Bath.

It will alſo contribute its Share to the Cure, both of a ſimple *Gonorrhœa*, and *Fluor Albus.* 'Tis often ſucceſsful in a *Palſy*, and they who uſe it much are very little affected with the Change of

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(*r*) De Praxi Medica, *p.* 70.

Weather; and yet the Abuſe of Bathing is very prejudicial; for Bath-guides are generally of a pale and ghaſtly Countenance, of a bloated Habit of Body, with ulcerated and ſwell'd Legs, which often ends in a *Dropſy*.

§ 4. Tho' Bathing hath been us'd with Advantage in all the Caſes I've mention'd; yet there is ſcarce any of 'em all, but in ſome Circumſtances it would be prejudicial: So that to reap the beſt Advantage we can by reading the Hiſtory of Cures perform'd by it, it is fit we ſhould enquire what Alterations are made by it in a Human Body, that ſo we may know in what Conditions to order it, and what not.

§ 5. I've already obſerv'd, That our Bodies are preſs'd upon by a Weight of *Air*, when the *Mercury* ſtands higheſt in the *Barometer*, equal to 39900 Pounds *Troy*. Now if this Weight be either conſiderably increas'd or leſſen'd, as 'tis often upon the Change of Weather, and the Influence of the *Planets*, it will certainly make a great Alteration in the Fluids of our Bodies, as I have proved before; But this Preſſure is never ſo much augmented as when we Bathe our ſelves: For *Water* being above 800 times heavier than *Air*, muſt needs greatly increaſe the Preſſure; and a Body ſunk 35 Foot in Water, ſuſtains double the Weight it does in the Air; and though when we are near the Top, the Preſſure upon our Bodies is mightily leſſen'd, yet 'tis much greater than in the open Air; ſo that all the Conſequents of a greater Preſſure will happen upon Bathing.

The tender *Fibrillæ*, of which the Skin is compos'd, being unequal in Strength and Tenſity, ſome of 'em will more reſiſt the Preſſure of the Water than others; from whence proceeds that *Rugoſity* of the Skin upon Bathing.

§ 6. 'Tis certain that the Surface of the Body, and thoſe Parts adjoining to it, will be the moſt and firſt compreſs'd, and thoſe at the Center the leaſt and lateſt; ſo that the Blood will be forced in great Plenty upon the *Viſcera*, where there is the leaſt reſiſtance: For this Reaſon, it is never ſafe for thoſe to Bathe who have weak or ulcerated Bowels; nor can they, without Danger of Life, or Swooning at leaſt, who have a very weak Pulſe, enter into a Cold Bath. The 4th *Aphoriſm* in the 3d §. is only accounted for this way, *viz. That cold Bathing heats robuſt Bodies, and refrigerates*

rates weak Ones: For the Contraction of the Heart in robuſt Bodies being ſtrong, makes the greater Conflict with the reſiſtance it meets with in promoting the Circulation of the Blood in ſuch as enter the Cold Bath; whereby the Blood is more broken, and the hot Particles ſet at Liberty, On the contrary, in thoſe who are weak, the Contraction of the Heat is but juſt able to continue the Blood in its Circulation, which will, by Reaſon of the Reſiſtance it meets with, be ſlower than before, and therefore they will have a Senſe of Cold, or be refrigerated.

§ 7. One that goes into a Cold Bath, if he plunge not himſelf over-Head, is ſubject to the Head-ach; the Reaſon of this is plain, from what I have obſerv'd before; for there being the leaſt Reſiſtance to the circulating Blood in the Head, which is preſs'd upon only by the Weight of the Air, it will run in ſuch Plenty thither, as to diſtend the Veſſels beyond their uſual Tone, and thereby occaſion a Senſe of Pain. And why People are ſo chearful, brisk and lively after Bathing, is not only becauſe the perſpirable Matter is thrown off more plentifully, (according to *Sanctorius's* *ctorius's* Obſervations (*s*) *viz. Melancholy is overcome by a free Perſpiration,* and (*t*) *Chearfulneſs, without an evident Cauſe, proceeds from Perſpiration ſucceeding well*) but alſo from a Senſe of leſs Weight upon the Body. A Perſon two Foot under Water (as they often are who uſe Bathing) ſuſtains a Weight of Water added to that of Air (ſuppoſing ſtill the *Area* of his Skin to be equal to 15 ſquare Feet) equal to 2280 Pounds for 2, the Number of cubical Feet of Water preſſing upon a Foot ſquare of the Skin × 76, the Number of Pounds in a cubical Foot of Water is = 152 × 15, the ſuppos'd Number of ſquare Feet on the Surface of the Body is = 2280 Pound *Troy.*

§ 8. So that the firſt and moſt obvious Conſequence of Bathing, is by a greater Preſſure upon our Bodies to ſtraiten the Veſſels, and thereby diſſolve the Humors, and make 'em fitter to paſs the Glands to be evacuated, as alſo to ſqueeze out any viſcid obſtructing Matter that ſticks to the Sides of the Veſſels, and renders the Motion of the

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(*s*) *Aphor.* 17. § 7.
(*t*) *Aphor.* 23. § 7.

Fluids of our Bodies more free and eaſy. In the next Place, they who enter into the Bath, have the Quantity of their Blood mightily increas'd in the *Brain* and *Viſcera*, being forc'd thither, where there is the leaſt Reſiſtance; and the Quantity of ſeparated Matter in any Gland, being as the Quantity of Blood multiply'd, into its Celerity at the reſpective Glands, (*u*) the Quantity of *animal Spirits*, of *Urine*, of *Gall*, *Succus Pancreatis*, &c. will be mightily increaſed, and any Impediment to the Secretion of theſe Fluids, will probably be removed, theſe Liquors flowing with a greater Celerity. So that,

1. If we wou'd have the Blood diſſolv'd; 2. or any viſcid Matter adhering to the Sides of the Veſſels remov'd; 3. or the Glands ſcour'd; 4. or a greater Quantity of Spirits generated and moved with greater Celerity through the Nerves; 5. or wou'd force Urine; 6. or remove Obſtructions in the *Liver*, *Spleen*, *Pancreas* and *Meſentery*, if they be not grown too obſtinate, (in which Caſe 'tis dangerous) we ought to order Bathing.

(*u*) Pro. 17. *Of Animal Secretion.*

It is for the 1ſt, 2d, and 3d Reaſon, that it cures the *Itch*, *Leproſy* and *Elephantiaſis*; it is for the 4th Reaſon, together with the former, that it cures the *Palſy*, *Melancholy*, *Madneſs*, and the Bite of a *mad Dog*; it is for the 5th, that it helps the Paſſage of Gravel; for the 6th, join'd with the other, that it helps *Cachectic*, *Icteric*, and *Hydropic* People, before the Diſtempers be too far advanced.

§ 9. Theſe Ends, which are compaſs'd by a greater Preſſure, are more effectually obtain'd by whatever increaſeth the Weight of the Water, or contracts the Fibres of our Bodies; it is the Salt in the Sea-Water, whereby its Weight is increas'd, that makes it more uſeful in the Cure of thoſe who are bit with a mad Dog; and the deeper you plunge 'em, the more effectual will it be, for a Reaſon that I have given before.

We know by Experience, that Cold contracts, and the more ſuddenly it is apply'd to our Bodies, the more violently it operates; but how much it contributes to the obtaining of the forementioned Ends we cannot certainly know, having no Rule, by which we may meaſure the Quantity of Contraction cauſed by it.

But that it is very conſiderable, we need not doubt, having ſo many Experiments to prove it. The Contraction of the Fibres is propagated throughout the whole Body, upon which Score all the Humors in the Body muſt be propell'd with greater Force through the Veſſels, in which they circulate; beſides that the Tenſity of the Fibres being greater, their Vibration will both be quicker and ſtronger, (and that in Proportion to their increaſed Tenſity) ſo that the Blood and Spirits will not only move more ſwiftly through the Canals, but alſo be extremely ground and broken; from whence all the Effects of more fluid Blood and Spirits, moving with greater Velocity, will neceſſarily enſue upon uſing the Cold Bath. Theſe Things, which I've ſaid, compar'd with the Conſtitution of the Patient to whom Bathing is preſcrib'd, will give you the Time he ought to ſtay in it, the Number of Times, (with the Intervals between them) he ought to uſe it, the neceſſary Preparatious for it, and what is to be done after it.

It is upon the Account of the contracting Power of the Cold Bath principally, that it ſtops *Hemorrhages*, *Gonorrhœa's* and the *Fluor Albus*, as alſo that it cures *venereal Impotency*.

Where the peccant Matter hath been made more fluxil, either by Medicines, Diet, or a regular Uſe of the Warm or Temperate Bath, in chronical *Rheumatiſms*, *Gout*, *Sciatica*, *Lameneſs*, &c. the violent contracting Power of the Cold Bath will often perfect the Cure. A *Nervous Atrophy*, which (*w*) *Baglivi* probably conjectures to be owing to an univerſal Relaxation of the Nerves which terminate in the Skin, is as likely to yield to the Cold Bath, as any other Method, provided the Pores, by Contraction, were not ſhut up too ſuddenly; for it would then throw the detained Matter upon ſome other Glands, whereby an Evacuation more dangerous might ſucceed.

§ 10. The next Property of the Bath, diſtinct from its Weight and Coldneſs, depends upon its being *moiſt*; and by this Quality of the Water, it ſoftens, relaxes, and makes pliable all the Parts of our Body, as ſufficiently appears by ſteeping any Part of an Animal Body in Water,

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(*w*) De Fibra Motrice & Morboſa, *p.* 67.

even the Horns and Hoofs of Beaſts will become ſoft and flexible, by a long Immerſion in Water, eſpecially if warm.

And that Water, as moiſt, hath a Property of relaxing, as 'tis prov'd by Experiment, ſo 'tis no Way inconſiſtent with what I've ſaid of the Preſſure of Water in general, nor the contracting Force of the Cold Bath in particular, the Preſſure of the Water is conſiſtent enough with relaxing and ſoftning of Bodies that are immers'd in it; for the Weight of the Water will enable it to inſinuate itſelf into the Pores of the immerſed Body, whereby it will become more ſoft and flexible; and yet, before it hath done this, will force together the Sides of any yielding Veſſel, ſuch as thoſe of a humane Body are, and thereby preſs out their Contents with a Velocity proportionable to the Weight incumbent on 'em: So that, after the Humors have been put in violent Motion by the Preſſure of Bath-Water, if the Perſon ſtay any conſiderable Time in, he will have the ſolid Parts of his Body ſoftned, relax'd and made flexible. This Hint is of great Uſe to determine the Time our Patients ought to ſtay in the Bath, in ſome Diſtempers more than others.

Now I ſhall enquire, how the contracting Power of Cold, and the relaxing Power of Moiſture can agree in the ſame Subject: That they cannot act intenſely at the ſame Time, but their Actions will deſtroy the Effect one of another, is evident to any who conſider, that contrary Qualities are inconſiſtent in the ſame Subject, at the ſame Time; but, as I obſerved in the laſt Section, Moiſture acts very ſlowly, and muſt be a long Time in performing its Work, whereas Cold acts quickly and on a ſudden, as we know by a Multitude of Experiments: Wherefore, tho' the Cold Bath may contract at firſt, yet, by ſtaying too long in it, it would relax; but there are none, who are able to bear the Cold ſo long as to produce the latter Effect. The principal Reaſon, why Cold ſo violently contracts the Membranes of our Bodies, is by making an ungrateful Senſation; for ſuch is the Frame and Conſtitution of the Animal Oeconomy, that the Soul has a Power of contracting, or relaxing the Membranes, and Veſſels of the Body, ſo as beſt to ſerve the Purpoſes of Life; and tho' we know not how the Soul operates upon the Body, yet would it be the greateſt Folly, to deny that which we daily experience to be true: We every Day obſerve, by the Command of our Wills, that the Members of our Bodies are mov'd a Thouſand different Ways, and 'tis as eaſy to imagine the Soul acts immediately upon the Nerves, and other ſolid Parts of the Body, as upon the animal Spirits, being that Spirit can act as eaſily upon ſolid Matter, as that which is fluid; the Mode of its operating being altogether unknown to us. In a relax'd State the Body is weak, feeble and unactive, and in this Condition it is in all the Paſſions which are attended with Pleaſure: On the contrary, whatever Paſſions of the Mind are attended with Pain, Grief, or any Kind of Uneaſineſs, as Malice, Revenge, Fear, a Fright or Surprize, puts the whole Body into a contracted State, as appears by the Shrinking the Veins, Sparkling of the Eyes, Contraction of the Pupil, Paleneſs of the Face, and eſpecially of the Lips; and this is none of the meaneſt Diſplays of infinite Wiſdom and Goodneſs, for the Preſervation of Man: For by this Means he is ſtrongeſt when he has the moſt Occaſion for it, either in reſiſting Force, when he thinks he can overcome it, or elſe in flying from it; in doing of which upon a

Fright, ſome have exerted ſuch Agility of Body as is almoſt paſt Credit, were it not the common Obſervation of Mankind, how vigorous and active we are in ſuch Circumſtances. The Reaſon of this exceſſive Strength, when the Veſſels of the Body are contracted, is evident from Dr. *Cheyne*'s Propoſition about the Strength of Animals, (*viz.*) ‘ That 'tis ‘ in a triplicate Proportion to the Quan‘ tity of Blood running in the Veſſels: Now the Quantity of Blood is mightily increas'd, in the Proportion it bears to its Veſſels, when they are contracted, to what it is when relaxed; for 'tis the ſame Thing to all Intents and Purpoſes, whether the Veſſels continue of the ſame Wideneſs, and the Quantity of Blood be increas'd, or the Quantity of Blood continue the ſame, and the Veſſels, in which it runs, be ſtraitned or contracted; ſo that we may expect the ſame Strength in an Animal, whoſe Veſſels are contracted to half their Wideneſs, as we may from an Animal, whoſe Veſſels are in their former Condition, and the Quantity of his Blood doubled; ſo that, beſides the Advantages common to all Sorts of Bathing, there is this peculiar in the *Cold Bath*, That it gives a violent and univerſal Contraction to all the Membranes and Veſſels of the Body; and there is nothing ſo ſurprizing in the ſudden Cures it performs, but what is accountable from this Cauſe.

§ 11. But Water hath certainly a ſoftning, relaxing Property, when apply'd to our Bodies, and by Means of this, 'tis able to bring about great Alterations; and as the Preſſure of the Water is made more effectual by Cold, ſo is its relaxing Power by a moderate Warmth: For a gentle Heat always relaxes the Fibres of our Body, by being pleaſing and agreeable to the Senſe of Feeling: So that, when we would have the Benefit of an univerſal Relaxation, we ought to go into the Temperate Bath, ſuch as *Buxton*, being the moſt temperate of any that I know of in *England*. The firſt Advantage, that many receive from the Uſe of this Bath, is an entire Refreſhment after Wearineſs with a Journey, 'Tis a common Cuſtom for Perſons wearied with Riding, as ſoon as they alight, to go into the Bath for a little Time, by which Means they become as lively and brisk, as they were in the Morning: For Wearineſs being nothing but an Overſtretching, or too great a Tenſity of the

Fibres, occaſion'd by uſing them too long or too violently, muſt, upon their being relax'd, go off again : 'Tis for the ſame Reaſon that Sleep takes off Wearineſs.

§ 12. This univerſal Relaxation cauſed by Bathing will ſo widen the Pores, that a vaſt Quantity of perſpirable Matter will be carry'd off, more than at another Time. 'Tis for this Reeſon that ſome corpulent People have, in a Fortnights Time, loſt above two Stone Weight by uſing of this Bath ; and all the Advantages of a free Perſpiration may be gain'd this Way, tho' it be true, we are more obnoxious to catch Cold afterwards : Yet, I think, a cautious Uſe of the *Cold Bath* after the *Hot* might not only prevent that Inconveniency, but, in many Caſes, render it much more beneficial. I've known that Bath I am ſpeaking of to remove violent Pains in the Head, Back and Joints. A Gentleman of my Acquaintance had a fixed Pain in his Breaſt for almoſt two Years, and was reliev'd by four or five Times bathing in this Bath. It helps a chronical *Rheumatiſm*, *Gout*, and the *Cholick*, *Lameneſs*, *Contraction* of the *Tendons*, &c. and how all theſe are perform'd, is eaſily known by the foregoing Theory. But,

§ 13. All the Effects of warm Bathing are better brought about by the Water inſinuating itſelf into the Body thro' the Skin, for being mixed with the Blood, it doth dilute and diſſolve the Acrid Salts in the *Serum*, by which they are better carried off, thro' the proper Glands deſign'd for their Evacuation: So that 'tis uſeful in all Diſtempers, where too much *Salt* abounds, as the *Scurvy*, and moſt *Cutaneous Diſeaſes.*

Tho' it be a general receiv'd Notion, that Bath Water enters into the Body, and ſo mixes itſelf with the Blood, yet moſt believe it upon very indifferent Grounds, or having never examin'd the Reaſon of the Thing, nor conſider'd the Objections againſt it. That Water hath a wonderful Power of inſinuating itſelf into any contiguous Body, appears from ſeveral Experiments. We ſee how Deal Boards will ſwell againſt Rainy Weather, the Watry Particles floating in the Air, by the Preſſure of the Air upon 'em, are forced into the ſlender Tubes of the Wood, where they meet with no Reſiſtance, the Particles of Air being too large to enter the ſame: It is certain, however true the contrary may appear to be, that the compounding Particles of Water are leſs than thoſe of Air, being the former will paſs thro' ſeveral Bodies, that the other will not. It will force itſelf thro' the Skins of Animals, even after they are dry'd and converted into Leather. (*x*) *Bellini* try'd the Experiment upon the Skin of a Man's Head, which, after it was moderately dry'd, ſuſpended it with a Stone in it, to ſink it in the Water, and in a few Hours Time the Water had forced its Paſſage thro' it: But nothing ſhews more the Force of Water to enter into contiguous Bodies, than the following Experiment.

Faſten a Piece of Whipcord, or a ſtrong Rope, of what Length you pleaſe, (but the longer, the more viſible will the Experiment be) to a Hook, or Staple, and at the Bottom of the Cord hang any Weight ſhort of what will break it, tho' never ſo great: You will find, that the Weight will riſe in moiſt Weather, and ſink lower in the dry: You may alſo raiſe the Weight by moiſtning the Sides of the Cord with a wet Sponge; by this Means a few Particles of Water may overcome any finite Re-

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(*x*) De Urinis & Pulſib. *p.* 146.

ſiſtance, if the Cord would bear it. Now, ſince there is but a little Quantity of Water, and that driven into the Sides of the Cord, with a Force no greater than the Weight of a Cylinder of Air incumbent upon the Water; therefore muſt the Water act by ſome Property, whereby its Force is greatly augmented, and that can be no other than that of the *Cuneus*; and the Forces of Wedges are to one another reciprocally proportional to the Angles their Edges make; but in Spheres, the greater or leſſer Degree of Curvity is to be conſider'd as their Angles, when Spheres are conſider'd as Wedges; and the Degrees of Curvity in Spheres are reciprocally as their *Radii*. Now the Particles of Water being ſo infinitely ſmall, leſs by much than thoſe of Air, muſt, when acting as Wedges, have their Powers infinitely increaſed, ſo as to overcome any finite Reſiſtance: Now, let the Reſiſtance the Water meets with, in entering into our Bodies, be what it will, yet 'tis hard to believe it's greater than what I've mention'd, which yet a little Quantity of Water will overcome. The Experiments I have taken Notice of, were made upon the Skins of dead

Men, or Beaſts, which would have put the Matter beyond Diſpute, had they been made upon ſuch as were alive. The only Difference then being, that, in the Living, Steams or Vapours are conſtantly raiſed into the Air, through the Pores of the Skin, in inſenſible Perſpiration; which is not ſo in thoſe that are dead. Theſe Vapours, tho' raiſed with a conſiderable Force, are yet unable to withſtand the *Impetus*, with which Water endeavours to inſinuate itſelf into contiguous Bodies, being ſo great as I have explain'd. And tho' the Quantity of perſpirable Matter is very great in 24 Hours, being (*y*) $\frac{5}{8}$ of the Meat and Drink a Man takes in a Day; yet, if we compute the Quantity that perſpires from any Part of the Skin, in a given Time, we ſhall find it too little by far to hinder the Entrance of Water into the Body, when we go into a Bath. For Dr. *Pitcarne* (*z*) hath demonſtrated, that the Matter of inſenſible Perſpiration in a Minute is the 1200th Part of the Place it comes from, (*viz.*) ℈i of the

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(*y*) Sanctorii Medicin Stat. *Aphor.* 6, § 1.
(*z*) Diſſertationes Medicæ, *P.* 130.

Skin perſpires $\frac{1}{1200}$ ℈ in a Minute, and conſequently ʒi of the Skin perſpires $\frac{1}{1200}$ ʒ in a Minute, now, ſuppoſe a ſquare Inch of the Skin weigh ʒi, then a ſquare Inch perſpires $\frac{1}{1200}$ ʒ in a Minute; but a ſquare Inch of the Skin is preſſed upon by a Weight when we bathe, more than in the open Air, equal to 96 Drams. For we may conclude, that our Bodies, taking one Part with another, are two Foot under Water, when we bathe our ſelves: So that every ſquare Inch of our Skin muſt bear the Weight of 24 Cubical Inches of Water, equal to 96 Drams: For a cubical Inch of Water being ʒiiii $\frac{384}{1728}$, throwing away the Fraction, 24 cubical Inches muſt be 96 Drams: Now, ſince only the $\frac{1}{1200}$ ʒ of Matter is perſpired through a ſquare Inch of the Skin in a Minute, therefore is the Elevation of the perſpirable Matter reſiſted by a Weight 115200 times greater than it ſelf; for 1200 x 96 = 115200. How great then muſt be the Celerity with which the perſpirable Matter moves, if we imagine it able to raiſe a Body 115200 Times heavier than it ſelf? Thus would it be, if the whole Quantity of perſpirable Matter evacuated in a Minute, was to exert its force at once upon the incumbent Weight of Water; but it is ſo far from doing that, that if the Exhalation of the Streams be not continual, as the Preſſure of the Water is, yet the Intervals betwixt the Times they are propell'd from the Body are very ſhort; ſuppoſe 60 of them in a Minute, being about the Number of Pulſes that a healthful Man's Artery beats in the ſame time: Then will the Quantity of Vapour, which exerts its force at once againſt the incumbent Water, be ſixty times leſs than what I firſt aſſign'd; which being multiplied by 1200=72000, the number of Parts into which a Dram of perſpirable Matter is divided, one part only of which exerts its force againſt 96 Drams of Water in a Second: So that the perſpirable Matter that riſes every Second, muſt raiſe a Weight 6912000 times greater than its ſelf, if it reſiſt the Entrance of the incumbent Water; for 90 the number of Drams of Water, incumbent upon an Inch ſquare on the Skin, multiplied by 72000, the number of Parts into which a Dram of perſpirable Matter is divided, is = 6912000 the Difference between the Quantity of Matter perſpired in a Second,

cond, and the Quantity of Water by which its Motion is reſiſted.

I think by this Time it ſufficiently appears, that the Bath Water will mix itſelf with the Humors of the Body, ſo that there is nothing ſo wonderful in Bathing, but what may be accounted for from ſome of theſe Properties of Water I've mention'd, without having Recourſe to the Salts with which Bath Waters are impregnated; which yet may contribute their Share in the Cure of ſome Diſtempers. What I've ſaid about Bathing, as 'tis moſtly new, ſo are my Reaſonings founded upon known Experiments; and how juſt my Inferences from 'em are, I leave to the Judgment of my Reader (ſuppoſing him to have the neceſſary Qualifications, and a moderate Attention) to determine.

§ 14. To apply the general Propoſition, *viz.* That Bath-Waters act upon a Humane Body by their Weight, (by contracting or relaxing the ſolid Parts, and diluting the Fluids of the Body) in all Diſtempers wherein Bathing might be beneficial, or injurious, wou'd take me up more Time than I've now to ſpare, thó' I may, perhaps, find a more ſeaſonable Opportunity of doing it,

Of wearing Flannel.

I ſhall now, according to my Promiſe, ſay ſomething concerning the wearing of Flannel. By what Fate ſo many of late fall in with an Opinion of the Advantage of wearing it, I can't tell; but this I'm well ſatisfied of, that it does Hurt to two for one that receives Benefit from it, and there is none to whom Flannel is more prejudicial than thoſe to whom 'tis generally preſcrib'd, being weak, faint, or hectic People; indeed it muſt be confeſs'd that there are ſome that receive Benefit by it, but they are very few, and I queſtion not, but ſome aſcribe that to Flannel, which is owing to ſome other Cauſe unknown, and which had perform'd the Cure both more ſpeedily and perfectly, had the Perſon never us'd it.

A Man of a robuſt Conſtitution, who eats and drinks well, and yet uſes not Exerciſe enough to throw off the Remains and Dregs of a full and nouriſhing Diet, and who is ſubject to *Defluxions*, *Catarrhs*, *Pains* in the *Joints*, and ſuch Diſtempers, as are owing to a *Plethora*, will receive Benefit by wearing Flannel, tho' too long an Uſe of it may ſo relax the Tone of the Fibres of the Skin, as to hinder that Perſpiration which before it help'd: For tho' the Quantity of perſpirable Matter be in Proportion to the Wideneſs of the Pores of the Skin, yet they are not the wideſt when the Skin is moſt relaxed, however 'tis neceſſary that the Skin be conſiderably relax'd, that the Pores may be increas'd to their greateſt Diameter.

The moſt certain and conſtant Effect of wearing Flannel, is to make a more free and plentiful Perſpiration, which tho' it be attended with great Advantages, (according to (*t*) *Sanctorius*) when moderate, yet, when exceſſive, nothing is more pernicious. The other Effects we obſerve from it, as they are more uncertain, ſo are they but the Conſequences of this; now ſince the increaſing of one Evacuation is the leſſening of another, therefore whenever too much is thrown off from the Blood either by Stool, Urine, or Spittle, it may be proper to wear Flannel.

(*t*) Medicin. Statica. *Aphor.* 10, 42, *and* 44. § 1.

Both *Walthmeidt* (*u*) and *Baglivi* (*w*) obſerve that *Diarrhœa*'s, from immoderate Grief, are incurable; and that principally from a Suppreſſion of Perſpiration, Grief contracts the Skin, as all troubleſome Paſſions of the Mind do; ſo that the perſpirable Matter being retain'd, will be thrown upon ſome other Glands, and if on thoſe of the *Inteſtines*, will continue a *Diarrhœa*. 'Tis alſo obſerv'd, that *Uſus Veneris* makes the Body Coſtive, and this it does only by promoting Perſpiration by an univerſal Relaxation of all the Fibres, which is always porportional to the Intenſeneſs of the Pleaſure; and for the ſame Reaſon 'tis, that weak Perſons are ſubject to a Looſeneſs in Winter (when the cold Air ſhuts up the Pores of the Skin) which they are free from in Summer. In a *Dyſentery* the laſt mention'd Authors, above all Things, order the Body to be kept warm, and eſpecially the Feet, to promote Perſpiration; and the latter obſerves a Conſent between the Skin and the Inteſtines, as *Hippocrates* did before him.

(*u*) De Diarrhœa inter Monita Medica.
(*w*) De Praxi Medica, *p.* 76.

Sanctorius, in his 46 *Aphor.* § 1, tells us, That the perſpirable Matter retain'd, neither being reſolv'd by Nature nor a Fever ſupervening, diſpoſes the Body preſently to a malignant Fever. And Dr. *Cockburn* in his Treatiſe of the *Diſtempers of Seafaring-Men*, gives Inſtances enow of Fevers from a ſuppreſs'd Perſpiration. In ſuch Caſes as this, whereby the preceeding Symptoms (as a Dejection of Appetite, ſpontaneous Laſſitude, ſudden Loſs of Strength, a Stupidneſs, with Inclination to Sleep, the Want of uſual Stools, *&c.*) a Fever is threatned, nothing will contribute more to prevent it, than reſtoring Perſpiration to its wanted Freedom; and Flannel may very well act its Part in this Scene. But theſe Caſes I have taken Notice of, are ſuch as Flannel is ſeldom or never order'd in, tho' in theſe only, we may expect Advantage.

That it may appear how prejudicial Flannel is to thoſe who perſpire too much, as moſt weak People do, and to whom the wearing of Flannel, is generally preſcrib'd, I ſhall obſerve from *Sanctorius*, That inſenſible Perſpiration is double to all the ſenſible Evacuations made by Urine and Stool put together; and that 'tis to that made by Stool as 40 to 4, (*c*) ſo that 'tis Ten Times greater than that by Stool; therefore a Man will be made no weaker by having Ten Times as many Stools as he us'd to have, than he will be by perſpiring only double the Quantity he does at other Times; further, if we conſider that the greateſt Part of our Stools are the Remains of our Food that cou'd not enter the Lacteals, we ſhall find the Difference much greater; for we can't imagine that above one Tenth of that we void by Stool, is evacuated from the Maſs of Blood, by the *Liver*, *Pancreas*, and *Inteſtinal Glands*; ſo that upon this Account there is as much deriv'd from the Maſs of Blood in one Day by Perſpiration, as by Stool in a 100; therefore if Perſpiration by any Means be doubled, in 24 Hours it will make a Man as faint as if he had 100 Times more Stools in the ſame Time than uſual. And there is none but who expect a Weakneſs from an unuſual Purging, and we daily experience the ſudden Danger of a *Diabetes*, wherein the Quantity of Urine

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(*c*) Medicin. Statica, *Aphor.* 59. § 1.

is increas'd, but take little Notice of an increas'd Perſpiration, becauſe *inſenſible*, for which Reaſon we are apt to aſcribe the Miſchief it occaſions to ſome other Cauſe.

A Conſumptive Gentlewoman in *Sheffield*, by the Advice of a Phyſician, putting on a Flannel Shift, tho' ſhe was able very well to walk about the Houſe, in two Days Time was confin'd to her Bed (from whence ſhe never roſe) without any other evident Cauſe than wearing Flannel.

If what I've ſaid be of Force enough to perſuade any to leave off wearing it, I wou'd adviſe 'em to do it in a warm Seaſon, and at the ſame Time, either make uſe of the Cold Bath, or the *Fleſh Bruſh*, which will prevent the Inconveniencies that otherwiſe wou'd attend it.

I was perſuaded to wear Flannel next my Skin, above ten Years ago, for a ſevere Cough that I had got; by which, I think, I receiv'd ſome Advantage, but after I had worn it a Year or two, I found it very troubleſome and prejudicial to my Health; it made me ſo exceeding tender, that I was not able to bear the leaſt Cold; and

I found by the Experiment of leaving it off, how much it diſpos'd me to Faintneſs, which I mightily ſuſpected before, and therefore I attempted ſeveral Times in Vain to get quit of it, but cou'd not without ſome Inconveniency, greater than I was willing to bear, till about two Years ſince, in a hot Seaſon going into a Cold Bath, I left it off without any Damage.

CHAP. VIII.

Of Meat.

§ 1. AN Animal Body wou'd be little better than a Clod of Earth, were it not ſor the vaſt Variety of Action, 'tis enabled to perform, and this it does by Means of an infinite Number of ſmall contractile Fibres, which in every Contraction and Diſtraction, which are Millions in a Day, by their Attrition one againſt another, file off from one another vaſt Numbers of little ſeparable Parts, by which the Fibres daily grow weaker, and wou'd ſoon be unfit to perform their Function, were they not as conſtantly repair'd as they are diminiſh'd. And whenever the Fibres are in a State of Relaxation, their Pores being open'd, then are they in the fitteſt Condition to have new Matter by the Force of the circulating Humors impacted to them, and in this Condition are the Fibres when the Animal is aſleep. So that as waking is the Time of ſpending, ſo is ſleeping the Time of recruiting,

ing; hence, by the by, we may obſerve the Neceſſity of Sleeping.

§ 2. Now 'tis our Food, whether Fluid or Solid, that furniſhes us with this Supply, and all that is neceſſary to qualify it for this Purpoſe, is only that it be by the Force of the *Stomach* and *Lungs* divided into Parts ſmall enough to enter the *Poruli* of the decay'd Fibres.

Hence we may deduce the Neceſſity both of taking in Food, and alſo of the Circulation of the Blood; for if either of theſe were wanting, there would be no Means left of repairing the Loſs the Fibres ſuſtain by their daily Contraction.

So that if a Man wou'd not deſtroy his Health, his Exerciſe ſhou'd be proportion'd both to his Eating and Sleeping: And Mr. *Fuller* in his *Medicina Gymnaſtica*, (tho' in other Reſpects it be an uſeful Book) is mightily out of the Way in preſcribing Exerciſe, and that violent too, without any Diſtinction to all Sorts of People that can but bear it, nay, tho' they cannot without being extremely tir'd. I ſhould have referr'd this to what I ſhall ſay about Exerciſe, but that it follows ſo naturally from what I have but juſt now advanced.

§ 3.

§ 3. Now that we might not neglect a Supply ſo neceſſary to the Preſervation of our Body, the bountiful Author of our Being and Happineſs, hath furniſhed us with two Appetities, the one to Solids, which is called *Hunger*, the other to Fluids, which is called *Thirſt*; what they are is better known by Experience, than by the beſt Definition, and as they are a *Stimulus* to the gratifying of Nature's Cravings, ſo would they be the ſureſt Guides both as to the Quantity and Quality of what we either Eat or Drink, were it not that moſt Men have vitiated and debauch'd them by Irregularity and Exceſs. Our Skill in the Animal Structure is not ſuch as to determine exactly either the Quantity or Quality of what we take into the Stomach, ſo as beſt to anſwer the End of Eating and Drinking.

Tho' *Sanctorius* (*a*) gives a Rule to meaſure that Quantity of Food, which is beſt ſuited to our Health, *viz.* 'Obſerve in the Morning, after a ſomewhat plentiful Supper over Night, 'what the Perſpiration in the Space of 'twelve Hours comes to, ſuppoſe it

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(*a*) Medicin. Stat. *Aphor.* 64. § 1.

‘ comes to fifty Ounces; then another ‘ Morning, after faſting over Night, but ‘ with this Condition, that thou didſt ‘ not exceed at Dinner the Day before, ‘ make the ſame Obſervation, as ſup‘ poſe the Perſpiration to have amount‘ ed to twenty Ounces; ſo having made ‘ theſe Obſervations, pitch upon that ‘ Proportion of Meat and other *Non-* ‘ *Naturals*, as may reduce the Perſpira‘ tion to a Mean between fifty and twen‘ ty Ounces, and that will be thirty five ‘ Ounces, and that is the Quantity ſought ‘ for.’ This *Aphoriſm* is ſo far from being an unerring Rule, that ’tis Faulty in ſeveral Reſpects, for the ſame Quantity of ſome Sorts of Meat and Drink, will almoſt expel double the Quantity of perſpirable Matter, in the ſame Time, that other Sorts will do it in.

In the next Place ſome Perſons, in Order to their Health, ſhould perſpire very freely, and others more ſparingly, according to ſeveral of his own *Aphoriſms*; ſo that after all, we muſt have Recourſe to ſomething elſe as our Director, in this momentous Affair, and that can be nothing but the two recited Appetites, which as they direct us in the Quantity, ſo ſhould they be the Meaſure of what Quantity we either Eat or Drink. And in general ſo much may we Eat or Drink, till Hunger and Thirſt be no longer troubleſome to us; for whenever we exceed theſe Bounds, we ſow the Seeds of various Diſtempers; but yet as *Hippocrates* (e) tells us, the Conſequents of a ſlender Diet, are more fatal, than of one that is more plentiful, wherefore 'tis dangerous for one in Health to live of too ſpare Diet.

§ 4. It is not only in this State of Health we are ſo much oblig'd to our Appetites, but even in moſt Diſtempers; were we to conſult 'em, we ſhould find 'em very good Guides, tho' not infalible. In *Inflammatory Fevers*, what is more deſirable than cooling Liquors? and in general nothing more beneficial. Or, what more deteſtable than *Cordials*, *bitter Alexipharmics*, and *teſtacious Powders*, ſuch as *Coral*, *Pearl*, *Gaſcoine*'s *Powder*, &c. and nothing more prejudicial? In *Hypochondriacal* Caſes the Appetite is oftimes Voracious, and Thirſt little or none at all: And nouriſhing Food in good Quantity is one of the beſt Remedies for this Diſtemper. And as their

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(e) *Aphor.* 5. § 1.

Drink is but little, ſo would they have it to be Strong and Spirituous, both advantageous to the Hypochondriacal. To produce all the Inſtances I could for the Confirmation of this Truth, wou'd be to give a Hiſtory of moſt Diſtempers; but ſhall ſave myſelf the Labour, by appealing to the Experience of every Judicious Phyſician.

§ 5. Our Food is to be conſider'd with Reſpect to its Quantity, its Quality, and the Times of taking it.

In the firſt Place, 'tis more ſafe to exceed a little in the Quantity, than to come ſhort, as appears by the laſt recited *Aphoriſm* of *Hippocrates*, as alſo from ſeveral others of * *Sanctorius*. And indeed the Damage of a more full Diet, is ſoon remedied either by Exerciſe, or gentle Evacuations, but the Decay of Strength, the natural Conſequent of too ſpare a Diet, is not ſo eaſily repair'd.

I am not here pleading for Gluttony, that being attended with the worſt of Conſequents, only wiſh that what I've ſaid may be a Caution to thoſe, who from the various Hiſtories they meet with, of ſuch as have lived a long Time, by a ſpare Diet, are inclin'd to ſet upon the like Practice; the Miſchief of which I've more than once obſerv'd. And, in general, thoſe Inſtances, as they are but few, ſo are they of ſuch as liv'd unactive and ſolitary Lives, the waſte of Spirits being but little, their Supply need but be anſwerable to it. Tho' People, who live of a ſpare Diet, are unfit for the Fatigue of Buſineſs, or any hard Labour; yet ſuch People if their Exerciſe be not too great, live longer than thoſe of a robuſt Conſtitution; and it is obſerv'd that Men of a pale Complexion, live longer than thoſe who have one more florid, and with a low Pulſe, than with one that is ſtrong; the Reaſon is plain, for the Humors of the laſt Sort are more *Volatile*, and ſo more ſuſceptible of any Impreſſion from external Agents: Their Solids alſo being more tenſe and Rigid, will, upon all Occaſions, make their Vibrations more quick and ſtrong, and ſo diſpoſe the Body to all Sorts of inflammatory Diſtempers; beſides, being more ſubject to break by their greater Tenſity, they will be liable to a more ſpeedy Decay by their greater Motion.

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* Vid. *Aphor.* 15, 16, 32, 33, 40, and 44.

§ 6. They, who uſe moſt Exerciſe, ſhould eat and drink moſt plentifully, by § 1, which ſhould therefore be a Caution to Men of a ſedentary Life, how they indulge themſelves either too much in Eating or Drinking, tho' when the *Meninges*, together with other Membranes, have been upon the Srtetch too long by intenſe and ſevere Study, a Glaſs of ſome ſpirituous Liquor, *ad Hilaritatem*, in pleaſant Company, is ſo far from prejudicing the Health, that 'tis attended with great Advantages; for, beſides the promoting Perſpiration, which was ſuppreſs'd by the foregoing Study, the over-Tenſe Fibres are relax'd, and ſo capable of having that Loſs repair'd they had ſuſtain'd by a long continu'd Contraction.

§ 7. On the other Hand, Gentlemen, that indulge to the greateſt Exceſs, both in Eating and Drinking, can uſe no better Antidote againſt the Inconveniences that otherwiſe wou'd attend 'em, than violent Exerciſe, if their Strength be ſuch as can bear it, and for this Reaſon 'tis, that ſome Gentlemen Fox-hunters ſurvive ſo many of their drinking Companions, who do not uſe the like Exerciſe, the Fibres being ſo mightily re

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lax'd, both by the Quantity and Spirituouſneſs of the Liquor they drink (for Drunkenneſs is attended with all the Signs of a general Relaxation, as Stammering in the Tongue, Staggering in the Limbs, Relaxation of the *Cornea*, Ditalation of the *Pupil*, &c.) will diſpoſe the Body to *Dropſies*, the *Jaundice*, *Conſumptions*, *Apoplexies*, *Palſies*, &c. (as appears by comparing the Theory of theſe Diſtempers with a general Relaxation) if theſe Conſequences be not prevented by reſtoring the Fibres to their former Tone again, which nothing is ſo likely to accompliſh as violent Exerciſe. I ſhall add no more to what I have ſaid on this Head, leſt I ſhould anticipate what I have to ſay in the Chapter of Exerciſe.

§ 8. *Hippocrates* (*f*) tells us, That the Aged require leſs Food than thoſe who are Younger, or in the Flower of their Age; and it was to the putting of this Obſervation in Practice, that the famous *Italian Cornaro* (yearly leſſening the Quantity of his Food as his Age advanced) imputes in a great Meaſure,

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(*f*) *Aphor.* 13. § 1.

both his Health and *Longævity*, being in good Health at the Age of 120.

The Healthful alſo require more Food than the Sickly, as the Strong do more than the Weak; for the more we nouriſh diſtemper'd Bodies, the more Damage we 'em (*g*), do and yet ſome Diſtempers do not only require a nouriſhing Diet, but that it ſhould be adminiſtred in great Quantities too, if the Stomach will bear it, as the *Hypochondraical* Diſeaſe, a beginning *Dropſy*, and in all Caſes, where the Pulſe is preternaturally weak and ſlow, provided Exerciſe be not neglected at the ſame Time; a ſpare Diet is more proper, in *acute* Diſtempers, than *chronical*, and it muſt be moſt ſlender when the Diſeaſe is at his Height (*h*). So muſt it alſo be in the Paroxiſms of intermitting (*i*). As to the Quantity, take the following Rules:

§ 9. The Quantity is always too much when it ſo diſtends the Stomach, as 1ſt, to cauſe Uneaſineſs, and then, by preſſing upon the *Diaphragm*, and the deſcending Trunk of the *Arteria Magna*, and the

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(*g*) Hipocrat. *Aphor.* 10. § 2.
(*h*) *Aphor.* 8. § 1.
(*i*) *Aphor.* 11. § 1.

aſcending Trunk of the *Vena Cava*, to give a Difficulty of Breathing, and obſtruct the Paſſage of the Blood through theſe Veſſels, and thereby forcing a greater Quantity than ordinary into the Head, ſo diſtends the Arteries, as in a great Meaſure to obſtruct the Paſſage of the Spirits thro' the contiguous Nerves, by which the Man becomes liſtleſs and ſleepy.

2. A Man in perfect Health ought always to riſe from the Table with ſome Appetite.

3. If either the Body or Mind be leſs fit for Action after Eating, than before; that is, if the Man be leſs fit either for Labour or Study, he hath exceeded in the Quantity.

§ 10. Our Food, as to its Quality, is either from the animal or vegitable Kingdom, 'tis either more or leſs nouriſhing; either ſolid, or fluid, ſimple, or more compounded.

§ 11. That taken from animal Bodies ſeems beſt qualify'd for the recruiting of diminiſh'd Strength, and repairing the Loſs our Fibres ſuſtain by daily Motion, conſiſting of Parts which have heretofore been apply'd to the ſame Uſe: Whereas our vegetable Food muſt be converted into Nouriſhment, by the proper Acti on of our own *Stomach* and *Lungs*, which are much weaker than thoſe of diverſe Animals we furniſh our Tables with every Day; being the ſolid Parts of an Animal are the very Matter with which they were nouriſh'd, amaſs'd together, in a ſolid Form, and the Nouriſhment of an Animal is but a little Part of that vegetable Food he lives on, as appears by the vaſt Quantity of Excrements which are voided by ſuch Creatures; therefore the ſame Quantity of Fleſh-Meat affords much greater Nouriſhment than Vegetables do. That it does ſo, is confirm'd by this Obſervation, that all Animals which live upon Fleſh-Meat, as they eat leſs, ſo are they much ſtronger, and oftentimes more ſagacious.

If an *Engliſh* Man eat a Pound of Beef at a Meal, a *Dutch* Man, who moſtly lives upon Vegetables, will eat two Pound of Cabbage or Turnip, and yet be no ſtronger, nor near ſo active as the *Engliſh* Man: Beſides this, whatſoever is apply'd to any Part of our Body for Nouriſhment, muſt be of a Volatile Alkaline Nature, as is evident from various Experiments upon the Blood, all which ſhew it to be fraught with *Alkaly Salts*, whether it be in a ſound or ſickly State; for the Solution of *Sublimate* curdles the *Serum* white; Filings of *Copper* turns it, in a Day's Time *Cæruleous*; *Syrup of Violets* and the Solution of *Turneſole* change it to a green, all Signs of a predominant *Alkaly*. A Diſtillation of the Fibres themſelves afford an *Oyl*, *Volatile Spirits*, like that of *Hartſhorn*, and *Volatile Salt*: So that, what Food ſoever is neareſt allied to the Juices that nouriſh us, and affords the greateſt Quantity of theſe Principles, is fitteſt for that Purpoſe. Now there is nothing bids ſo fair for this Character, as fleſh Meat, Jellies, Broth, Soops, &c. all which afford a great Quantity of an oily Alkaly: On the contrary, vegetable Food, as it is more viſcid, and ſo requires more Labour of the Stomach, to render the Parts of it ſo ſmall as to enter the *Lacteals*; ſo is it ſtock'd with *acid* Particles, which muſt be converted into *Alkaly* by the Force of the *Stomach*, *Lungs* and *Heart*, before it be fit for Nouriſhment.

§ 12. *Bread*, as it is the moſt univerſal, ſo 'tis the moſt nouriſhing of any Sort of vegetable Food, and 'tis more or leſs ſo, according to the Grain 'tis made of, the different Way of preparing it, and the Time of keeping it before it be eaten. That made of Wheat is moſt nouriſhing, eſpecially if it be well freed from the Bran; but then 'tis digeſted more difficultly, and inclines them that eat it to be coſtive; but if it be mix'd either with Rye or Bran, it looſens the Belly: Few Stomachs can digeſt it *unfermented*, tho' ſome hard Labourers conſtantly eat it ſo. The better our Bread is fermented, the eaſier it is to be digeſted, for a great Deal of that is done by Fermentation, which, otherwiſe, might have been done in the Stomach by *Trituriti0n*; for, as Digeſtion is nothing elſe but the Reduction of our Food into Parts ſmall enough to enter the *Lacteals*, ſo the Work of Fermentation is only an intimate Diviſion of the fermenting Maſs, whereby the *Coheſion* of its Parts is leſſened, and ſo becomes leſs viſcid, and eaſier converted into Chyle in the Stomach. 'Tis alſo more difficult to digeſt Bread that is new, than that which is a Day old, for the very ſame Reaſon, the new being much more viſcid than the old; and 'tis upon this Account, Panado's and Puddings made of Bread agree better with weak

Stomachs, than ſuch as are made of Meal. I think it proper enough, in this Place, to take Notice of the pernicious Practice of many, who feed their Children with Milk Pottage, boil'd till it be almoſt as glutinous as Syzing; 'tis no Wonder, that ſuch Children have windy Diſtentions of the Belly, ſometimes purge, and at other Times are coſtive, are troubled with the Gripes, and ſometimes with Convulſions: Thoſe Diſorders are often better remov'd by an Alteration of their Diet, than by any Medicine.

The Grain that is moſt in Uſe is Wheat, Rye, Barley, Oats, Peaſe and Beans, (Rice is ſeldom us'd among us, but on a phyſical Account, in Order to bind the Belly, but oftentimes very improperly, being ſo difficult to digeſt,) they only differ in their being eaſily or more difficultly digeſted, and in affording more or leſs Nouriſhment.

Wheat is preferable to the Reſt, in both Reſpects, yet Rye, Oats and Barley are good Food, eſpecially if well prepar'd; Peaſe and Beans are too viſcid, whereby they become windy, and offend the Head and Stomach.

This Sort of Food, except when it proves too windy, is proper for Perſons of a robuſt Conſtitution, whoſe Fibres are too tenſe, and whoſe Blood abounds too much with Alkaly Salts, for they all afford, in Diſtillation, a conſiderable Quantity of Oil and Acid. Upon which Account, they are fit to ſoften and relax the over tenſe Fibres, and alſo blunt and correct the acrid, alkalious Salts in the Blood: So that 'tis very uſeful in the *Scurvy*, *Leproſy*, and moſt other *cutaneous Diſtempers*; 'tis alſo proper for thoſe who are ſubject to inflammatory Diſtempers, as *Pleuriſies*, *Rheumatiſms*, or *Effervеſcences* of Blood, fluſhing *Heats* in the Face, or other Parts, the periodical *Aſthma*, &c. Salads and Roots, of the cooling Sort, and ſub-acid ſweetiſh Fruit, which I need not name, being known to every Body, have pretty near the ſame Virtue, excepting that ſome of them are too flatulent to be uſed with Safety by Men of weak Stomachs.

The hot Salads and Roots are moſt proper in thoſe Caſes, where fleſh Meat is beneficial; as 'tis in all Diſtempers where the Blood is too *ſerous*, the *Motion too ſlow*, and the Fibres too *lax*.

§ 13. I've known Preparations from Fleſh, even in ſlow Fevers, more uſeful than the moſt generous Cordials the Shops could afford. The firſt Time I uſed 'em in this Caſe was upon myſelf, when, after I had been ten Days in a Fever, was ſeiz'd with ſuch frequent fainting Fits, that my Life was in Hazard every Day, tho' I took a great Variety of Cordials, which always refreſh'd me for the preſent, but their Force were ſoon ſpent, and my Fits return'd ſo often, that I was almoſt conſtantly drinking of my Cordials, till, after a Day or two, I reſolv'd to try ſome good Chicken Broth, which, in little Quantities, agreed well enough with my Stomach, and relieved me much more than my former Cordials. This encourag'd me, my Faintneſs continuing, tho' not ſo dangerous, to have it ſtronger, till at laſt it was as ſtrong as Mutton, Veal and Chicken, boil'd together, cou'd make it, and of thoſe I took a Porringer every two Hours, for twenty Days together, which was ſo far from heating me, or cauſing any Uneaſineſs, that I complain'd of nothing during all that Time, but my exceſſive Weakneſs: Notwithſtanding which, I aroſe from my Bed every Morning, tho' with the utmoſt Difficulty; without doing this, I verily believe I had loſt my Life, tho' I uſed all other rational Methods that were ſuggeſted to me. The Reaſon why lying too much in Bed in great Weakneſs is ſo prejudicial, I ſhall account for in a more proper Place; but ſhall, before I conclude this Hiſtory, obſerve to you, that of all the Cordials I try'd during my Fever, nothing reliev'd me ſo much as the *Cortex*, neither were the Effects of any Cordial near ſo durable. This Succeſs, immediately upon my Recovery, encourag'd me to try the ſame Method with a young Gentleman, who, by the Advice of one who underſtood very little of his Caſe, was, in two Days Time, twice blooded, vomited, purg'd, ſweat and bliſter'd, which had ſo infeebled him, that he cou'd ſcarce ſpeak, or turn him in his Bed; his Pulſe was ſlow and exceeding weak, and ſometimes intermitting; his Urine pale, his Tongue cover'd with a mucous Matter, yet not thirſty; and all this brought about in two Days Time: For when he was firſt ſiez'd, his Fever was very acute, with all the ſuitable Symptoms of Thirſt, Heat, Pain in the Head, *&c*,

by eating plentifully of good Broth, and the Interpoſition of ſome gentle Cordials, in a few Days Time he was freed from all his dangerous Symptoms, and after that treated ſuitably to his Diſtemper, of which he recover'd: But juſt upon his Recovery, was ſeiz'd with violent *pleuritic* Pains, and, I being out of Town, by the Advice of another, was twice blooded, and confin'd to Water-gruel; by which Means, tho' his Pain was never a whit abated, his Strength was mightly diminiſh'd, his Pulſe was ſoft, weak and ſlow, which, in a true *Pleuriſy*, is always *hard* and *quick*; therefore, gueſſing the Pain to be owing to the Viſcidity of the Blood, and the Deficiency of the Spirits (whereby the Heart was diſabled from contracting with that Force, which was neceſſary to carry on the Circulation, ſo that its difficult Paſſage through the Capillaries in the Breaſt was the Occacaſion of that Pain) rather than to either the too violent Motion of the Blood, or the too great Tenſity of the Solids (which muſt rather have been in a lax Condition at the End of ſuch a Fever) therefore, inſtead of purſuing the common Methods, I return'd him to his nouriſhing Diet and Cordials again, by which Means, in a little Time his Pain was abated, and in twenty four Hours had quite left him, and then he recovered without any Relapſe. I think thoſe two Inſtances ſufficient to ſhow, that all the Ends of Medicine are not to be obtain'd only by the Uſe of *Drugs*; but if we would ſerve our Patients in their greateſt Exigencies, we muſt ſometimes tread an unbeaten Path, but never without a truſty Guide to direct us, *viz.* mathematical Reaſoning founded upon uncontested Experiments. It is paſt Doubt with me, whatever ſome Phyſicians ſay againſt *Theory*, which they don't underſtand, that 'tis not only uſeful, but a neceſſary Qualification of a good Phyſician. For one that underſtands the Structure of a humane Body; the Nature of the Solids and Fluids; the Manner how animal Actions are performed; the Nature of *Secretion*; the Effect of either increaſing or leſſening any Evacuation; the known Laws of Motion, as apply'd to *Mechanics* and *Hydroſtatics*, with the Application of 'em to the Alterations made in human Bodies, is, *Cæteris paribus*, better qualified for a Phyſician, than one who is ignorant of theſe

Things, as too many, who bear a great Character in the World are, which, for Want of ſolid Reaſoning, they maintain by a ſupercilious Look and affected Gravity; whoſe Word ought no ſooner to be taken for the Safety of any Medicine they preſcribe, (for the Preſcription of which they can give no Reaſon) than that of a *Mountebank* upon his *Stage*, who will never fail of telling the People, how many Hundred he hath cured in all Diſtempers.

I wou'd not be miſtaken in the foregoing Hiſtory, as if I commended a nouriſhing Diet in all Fevers, whereas I think it dangerous in ten, to one wherein 'tis beneficial; and even in thoſe where 'tis proper, 'tis not ſo in every *Stadium* of the Diſtemper. The more *acute* the Diſtemper, the more ſlender the Diet; and *Hippocrates* tells us, That a moiſt Diet is proper in all Fevers, eſpecially for Children (*k*).

§ 14. It is a great Miſtake to think, that the Stomach will always digeſt Food that is liquid, better than that

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(*k*) *Aphor.* 16. § 1.

which is ſolid, ſince it is contrary to daily Experience; tho' in general that Notion is true, but in many Diſtempers 'tis otherwiſe, nay, in the ſame Diſtemper, Liquids agree with one Man, and Solids with another: But to determine, when to preſcribe the one or the other Sort of Food, beſides the Patient's own Obſervation what is eaſieſt to his Stomach, which is never to be ſlighted, this is the Rule: Whenever the Fibres of the Stomach are too lax, and its Cavity and Lining too much ſtuffed with a *viſcid* Slime, then is ſolid Food more proper than that which is liquid. On the contrary, when the Fibres are too tenſe and ſpringy, and the internal Coat of the Stomach robb'd of its ſlimy *Mucus*, then are Liquids more proper than Solids: The Pulſe, the Urine, and eſpecially the Spittle, give very probable Conjectures, in what Condition it is in thoſe Reſpects.

§ 15. Tho' compounded Food be very delicious, and better fitted to gratify the Craving of a luxurious Appetite, and ſuit the Nicety of a weak or deprav'd one, for which Reaſon it may ſometimes be allow'd; yet it is ſeldom or never ſo wholeſome as that which is more ſimple, provided it be of eaſy Digeſtion, and afford good Nouriſhment. For the different Degrees of Coheſion there are, in the Ingredients of which *made Diſhes* are compounded, muſt needs make the Digeſtion, or in other Words, the Diſſolution of our Food into ſuch Parts as are ſmall enough to enter the *Lacteals*, more difficult.

§ 16. As to the Times of taking Food I ſhall conſider 'em in reſpect to their Number in 24 Hours, and as to their Seaſonableneſs.

§ 17. It is the Cuſtom of ſome to eat once, ſome twice, and ſome three times a Day; now the Number of Times a Man ſhou'd eat in a Day is to be determin'd by the Age, Strength, Appetite, Quantity of Food he takes at a Time, its Quality as to its eaſy or hard Digeſtion; for the Young, the Weak, and thoſe who take but little Quantities at a Time, of Food that is eaſily digeſted, ſhould Eat oftner than thoſe who are of full Age, Strong, of a voracious Appetite, who eat great Quantities at a Meal of Food, which is difficultly digeſted. Every Man ought to Eat ſo often as is neceſſary to ſupply the Loſs he daily ſuſtains, by the Motion of his Muſcles; ſo that they who have little Appetites, ſhou'd uſe but little Exerciſe, or eat often; for if eating once a Day will not ſupply our daily Expence, we muſt eat twice, and if that be alſo be defective, we ſhould eat three times a Day. The Signs of too long Abſtinence are, after Hunger, a Faintneſs with a peculiar Uneaſineſs about the Heart-Pit, a low and ſtringy Pulſe, a Weakneſs in the Joints, Inconſtancy of the Mind, and if it be continu'd yet longer, will bring on dangerous Symptoms, as *Lypothymies*, *Vertigo's*, *Epilepſies*, &c. the laſt of theſe I obſerv'd to happen to a Gentleman, by too long Abſtinence, join'd with Trouble of Mind, from his Misfortunes in the World; for as I was Riding with him at Five in the Afternoon, having eat nothing all that Day, and very little for ſome Days before, fell from his Horſe in a violent Epileptic Fit, having never had one before in his Life, nor ever ſince, but once, upon the like Occaſion; I got him into a Houſe hard by, and by forcing ſome hot Ale into his Stomach, brought him out of his Fit, and then perſuaded him to eat ſome Victuals, and drink a Glaſs or two of

Ale after 'em, by which he was mightily refreſh'd, and recover'd without any other Medicine. And indeed nothing is more proper in ſuch a Caſe, whereby Abſtinence, together with intenſe Thoughtfulneſs, all the Fibres of the Body were wonderfully contracted, and their *Elater* prodigiouſly increas'd, than what would cauſe a general Relaxation, as ſpirituous Liquors of all Sorts do, firſt in the Stomach, and then in the reſt of the Body; ſo that Ale, for want of other Cordials, became an excellent Medicine.

§ 18. There are ſome who do not only repair their daily Loſs, by one Meal in 24 Hours, but increaſe the Bulk of their Bodies to a vaſt Extent, as we may obſerve in ſome fat People; and I doubt not, but that 'tis beſt for ſuch to eat ſeldom, for more Reaſons than only to prevent their further Feeding.

§ 19. But in general, 'tis beſt to eat twice a Day, at ſuch convenient Diſtances as that the Food taken at one Time may be digeſted before any more be eaten. In order to determine this Matter, I ſhall obſerve what happens upon eating plentifully, as alſo upon long Abſtinence, even where the Stomach is not loſt, but more voracious.

§ 20. Hunger, as all uneaſy Paſſions do, puts all the Body into a contracted State, as Eating on the other Hand relaxes it, and the Relaxation is always proportionable to the Pleaſure of Eating, and this in Proportion to the Hunger: So that thoſe who faſt till they be the moſt hungry, as their Veſſels are hereby the moſt contracted, ſo will they upon Eating be the moſt relax'd; all Secretions being nearly ſuppreſſed in the firſt Caſe, and mightily increaſed in ſecond, (*by the* 17*th Propoſition of Secretion*) the Veſſels being more tenſe in ſevere Hunger, their Vibrations will be ſmarter, and Part of the Subſtance more eaſily worn off, and ſo diſpoſe ſooner to old Age; the Relaxation upon Eating being alſo greater than ordinary, would, in ſome Meaſure, compenſate for the Loſs, by giving Liberty for the Application of Nouriſhment to the worn Fibres, but that the Time is improper, the *Succus Nutritius* of the preceding Meal being all ſpent, and that of the preſent being yet in the Stomach, this Relaxation, tho' very great, will be of little Uſe.

'Tis certain, that upon this greater Relaxation, when the Stomach is cramb'd with Meat, 'tis leſs fit for Digeſtion; for the Force of the Stomach, upon a little, is greater than it is upon a greater Quantity of Food, and therefore a great Quantity is more difficultly digeſted than a little, and the Fibres being weaker, by Relaxation, is even unable to digeſt a moderate Quantity; and for this Reaſon it is, that a healthful Man ought to riſe from his Table with ſome Appetite.

Thus the Digeſtion being weaker, the Chyle will be more viſcous, the Motion of it through the *Duodenum* ſlower, and the Orifices of the *Lacteals* wider, by the ſuppoſed Relaxation; upon all which Accounts, a more viſcid Chyle will be carry'd into the Maſs of Blood, which generally requires more Labour to make it fluid, and fit for Nouriſhment, than they are able to bear who eat but once a Day.

This greater Quantity of Food, when 'tis well warm'd in the Stomach, will ſwell and rarify itſelf, and that the more too, becauſe the relax'd Fibres of the Stomach are not able to reſiſt it, and ſo cauſe a windy Diſtention of the Stomach with ſome Uneaſineſs at leaſt; whereby Perſpiration is ſuppreſs'd as well as by an empty Stomach (*l*), which is more or leſs inconvenient, tho' Cuſtom may make it undiſcernable: For I know ſeveral who eat but once a Day without any apparent Prejudice, which yet may be the Means of ſhortning their Lives, tho' it ſeems not in the leaſt to impair their Healths at preſent.

Beſides this, a great Quantity of Chyle being poured into the Maſs of Blood at once, and that but ſeldom, muſt needs make a great Alteration in the Body, and put the Inſtruments of *Sanguification* more upon the Stretch, than when a little Quantity is poured in more frequently.

§ 21. I have obſerv'd before, that the Times of Eating ought to be ſuch, that the former Food may be digeſted before more be eaten, and it ſhould be alſo at ſuch Diſtance from Bed-time, that Digeſtion be nearly finiſh'd before we ſleep; for the Preparation of our Food, by the Stomach, and the Application of it, to nouriſh the Body, are Actions ſo vaſtly different, that they are inconſiſtent one with anothar. Digeſtion is perform'd by Contraction, as Nutrition is

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(*l*) Vid. Sanctor. *Aphor.* § 3.

by Relaxation, ſo that the Food ſhou'd be digeſted before the Fibres be relax'd, in order to their Nouriſhment; beſides, ſleeping immediately after Eating, as it makes a more viſcid Chyle, ſo does it derive more of it than ordinary into the Maſs of Blood, thro' the inlarg'd Orifices of the *Lacteals*, and conſequently produces all the ill Effects that we may expect from the Blood when too viſcid.

§ 22. As to the moſt ſeaſonable Times of Eating in general, they are about three Hours after riſing in the Morning, and four or five before going Bed, as appears by comparing ſeveral *Aphoriſms* of *Sanctorius*, viz. 57, § 1. the 20, 28, and 35, § 4.

The Body, upon waking, being put into a contracted State, if there be any Remains of the laſt Meal, either undigeſted in the Stomach, or not ſufficiently attenuated in the Veins and Arteries, or adhering to the Orifices of the excretory Veſſels, will, if not diſturb'd by Eating or Drinking, ſo increaſe the Celerity of the Blood's Motion, and the vibrating Force of all the Veſſels, as both to digeſt the remaining Food, attenuate that which is too viſcid, and expel that which lies at the Orifices of the

Glands. And when theſe Ends are once compaſs'd, then 'tis the fitteſt Time to eat again, and this commonly happens between three and four Hours after riſing, Perſpiration (being the moſt plentiful two Hours after Sleeping, by the laſt *Aphoriſm*) ought by no Means to be diverted by Eating; ſo that we ought not to eat till after this Time, according to my Aſſertion, tho' 'tis true, that the Difference of Conſtitutions, together with the different Way of living ſome have from others, make ſome Alteration in this Reſpect.

If we go to Bed before our Meat be digeſted, the Stomach will be diſturb'd in the Performance of its Orifice, by that general Relaxation that will happen upon Sleeping, and all the ill Conſequents taken Notice of in the laſt § will enſue.

The Times of Eating ſhould be different to thoſe that drink a Bottle every Night; for their Victuals ought nearly to be digeſted before they drink, or elſe their Suppers ought to be very ſlight, and of ſuch Food as eaſily digeſts, and yet ſolid rather than what is liquid; for a Reaſon I have more than once given in this Chapter.

CHAP. IX.

Of Drink.

§ 1. W*ATER* is the principal Ingredient in all our Drinkables, and the purer or leſs mixed we find it either with Vegetable, Mineral, or Earthy Particles, the better it is. Its Purity is beſt known by its Tranſparency, its Fluxility, Inſipidneſs, and Lightneſs; for there is no Mixture but what will alter it in ſome of theſe Reſpects, and as that Water is the wholſomeſt, which has the leaſt Number of foreign Particles mix'd with it; ſo there is none but what has ſome, as appears from Dr. *Woodward's* Experiments upon Vegetation; and 'tis from this Mixture that 'tis liable to ſtink and decay upon its Stagnation; for theſe Particles being of different Gravities, will ſome ſubſide, whilſt other emerge, and by their contrary Motions ſo break and divide themſelves, as ſome of 'em to become ſpecifically lighter than the Air, and in their Elevation ſtrike the Noſtrils with an ungrateful Smell, which when ſpent in the Air, and the reſt of the ſolid Matter that was contain'd in the Water ſettled in its proper Place, the Water becomes ſweet again, as we know by Experience. Rain-Water is the freeſt from Mineral Particles, but well ſtock'd with Vegetable, which is the Reaſon that it ſo ſoon putrifies, otherwiſe it would be the moſt wholſome of any: But Spring-Water, tho' it be heavier than Rain-Water, yet being leſs apt to putrify, is certainly fitter for common Uſe, provided it will bear Soap, and the Fountain run with a ſtrong Current.

Cor. 1. From what hath been ſaid, it appears of what dangerous Conſequence the *Stagnation* of our Waters wou'd be, and how kind Providence hath been to us by the *attractive* Force of the Sun and Moon, to make ſo violent an Agitation in the Sea-Water, twice in every twenty five Hours, as we obſerve upon the flowing of the Tides. And Tempeſts, tho' prejudicial to the Mariners, yet ſeems neceſſary for the better Obtainment of this End; for without Storms and Tides, the *Ocean* in a little Time wou'd be ſo corrupted, as both to poiſon the Fiſh, and alſo infect the Air, with ſuch Quantites tities of putrified *Effluvia,* as in a little Time would kill the Land Animals alſo.

Cor. 2. That our Water is fitteſt for Uſe, after it hath ſtood ſome Time in a cool Place to ſettle; the Earthy Mineral Particles will ſome of 'em fall to the Bottom of the Veſſel, and the Water become more Clear and Light.

Cor. 3. That Water ſhould not be much boil'd before Uſe, as many do for the making of Tea and Coffee, for tho' boiling may promote the Separation of any *Heterogenous* Matter from the Water, if it ſtand ſome while after to ſettle; yet by Evaporating the lighteſt, and therefore the beſt Part of it, what remains muſt be ſo much the worſe, and moſt Water may be boil'd till it have a Saltiſh Taſte.

§ 2. It is ſo neceſſary to our Subſiſtence, that we cou'd not live a Moment without it, 'tis this Element that furniſheth all the Fluid Part of our Humors, without which they could not circulate, and that diſſolveth all the Salts in the Blood, whereby ſome are carried to their proper Places within the Body, and others to proper *Emunctories* for their Expulſion from it. It ſerves to prepare our Food, and then for a *Vehicle* to convey

vey both it and Medicines out of the Stomach into every little Meander of the Body, both for Health and Nouriſhment.

§ 3. *Milk*, *Ale*, and *Wine*, are nothing but certain Quantities, tho' in different Proportions, of *Salts*, *Sulphurs*, and *Earth*, ſwimming in pure Water; the Difference between *Fermented* and *Unfermented* Liquors conſiſts in nothing but the different Proportion of the *Earthy* Particles, and Subtilty of the *Sulphureous* and *Saline* ſwimming in Water; for from *Muſte* or the unfermented Juice of *Grapes*, or from a Decoction of *Malt* before Fermentation, may, by Diſtillation, be extracted great Quantities of Oil, and the *Caput Mortuum* will be conſiderably more than after Fermentation; but when by Fermentation (which is only a violent Agitation in any Liquor, whereby the *Cohæſion* of the Parts is alter'd, and thoſe which are too heavy to ſwim in the Liquor ſunk to the Bottom, and ſuch as are too light forced up to the Top,) the *Sulphureous* and *Saline* Parts are Volatiliz'd, that which before was Oil and eſſential Salt, now, upon Diſtillation, ariſes under the Form of Spirits, and Volatile Salt, ſo that Spirit is nothing but Oil and Salt ſubtiliz'd, or whoſe Parts are exceedingly divided; the Pungency of Spirits upon the Tongue is owing to the ſharp Salts now ſet at Liberty, which where ſheathed before in the Viſcid Parts of the unfermented Liquor.

§ 4. In all Caſes wherein too many Salts abound in the Blood, ſuch as the *Itch*, *Scurvy*, *Leproſy*, &c. unfermented Liquors (if cautiouſly uſed) are the moſt proper, as they alſo are for ſuch who are ſubject to *Inflammatory* Diſtempers, as *Pleuriſies*, *Rheumatiſms*, or the like. When we deſign to *Relax* by Water drinking, we ſhould take it warm, if not hot, with the Infuſion of ſome Drug or other in it, to increaſe its relaxing Virtue, ſuch as the Roots of *Sarſa*, *China*, *Liquorice*, *Althæa*, &c. It may be mixed with Ingredients that will leſſen its relaxing Property, ſuch as *Coffee*, *Tea*, or any ſort of bitter Herb; for all Bitters contract the Fibres of the Stomach, for which Reaſon they are all accounted *Stomachics*.

§ 5. *Coffee* and *Tea* are now become the general Entertainment of the Ladies, and moſt People of Faſhion drink great Quantities of them, and without doubt very often to their Prejudice. The Water is very prejudicial to ſome, as the Bitterneſs of the *Coffee* and *Tea* is to others; for none who are of a lax Habit of Body can bear much Water drinking, nor of a robuſt and tenſe Habit many Bitters: So that they who will drink theſe Liquors, ſhould both adapt the Strength and Quantity to their Conſtitutions.

Fat, Moiſt, Phlegmatick People, may drink their *Coffee* very ſtrong, with an empty Stomach, without either Sugar, Milk, or Butter; for the more the Fibres are irritated by it, the more ſtrongly will they contract, and thereby the Stomach will cleanſe itſelf from all offenſive and ſuperfluous Phlegm, then being admitted into the Maſs of Blood, will, by increaſing its Motion, leſſen its Humidity; it will alſo become an univerſal *Stimulus*, and ſo recover the Tone of the Fibres too much relaxed in ſuch a Conſtitution. On the contrary, People of a lean, dry, choleric Conſtitution, ſhould either totally abſtain from it, or drink it weak, with Butter or Sugar, upon a full Stomach, for 'tis to Perſons of this Conſtitution that it is ſo prejudicial, when they either take it too ſtrong, or in too great Quantities. It dries their ſolid Parts, expends the *Serum* of the Blood, gives *Palpitations* of the Heart, Trembling of the Hands, a weak and cloudy Pulſe, Oppreſſion at the Breaſt, Syncopies, Aſthma's, and Vapours; it prevents Sleep, and blackens the Teeth, and all this it doth by an active hot pungent Oil. It affords of this Oil, by diſtilling in a Retort, almoſt double the Quantity to either Wheat or Horſe-Beans, for which Reaſon it cannot be counterfeited by either of them. *Coffee* yields two Ounces and a half and two Scruples of Oil, whereas the ſame Quantity of Wheat yields but an Ounce and ſix Drams, and Horſe-Beans but an Ounce, three Drams and ten Grains.

§ 6. What I've ſaid of *Coffee* is moſtly applicable to *Tea*, ſaving that this makes not ſo ſtrong an Irritation upon the Fibres as *Coffee* does; both are uſeful in ſuch Caſes where drying Decoctions of the Woods and Lime-Water are proper. *Tea* is uſeful in the Stone (*m*).

Sanctorius (*n*) tells us, That *drinking of Water hinders inſenſible Perſpiration, but advances Senſible.* And this not only gives us a Hint in what Caſes to uſe it,

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(*m*) Waldſchmid. de Cal. Renum inter monita Medica.
Sydenham Opera univerſa, *p.* 526.
Baglivi de praxi Medica, *p.* 90.

(*n*) *Aphor.* 67. § 3.

and what not, but alſo lets us into the Knowledge of ſome of its more immediate Effects upon the Humors of our Bodies, for ſince an increas'd Perſpiration is the Effect of an increas'd Celerity of the Blood's Motion, or an Enlargement of the Pores of the Skin (*by the* 20*th and* 21*ſt Propoſition of Animal Secretion*) therefore a diminiſh'd Perſpiration muſt be the Effect of a ſlower Motion in the Blood, or ſtraiter Pores in the Skin: So that Water drinking is proper in *Fevers*, the *Ancients* giving as much as the Patient wou'd drink, as alſo in all Chronical Diſtempers in which there is an *Efferveſcence* of the Humors, ſuch as the *Gout*, *Defluxions*, *Head-achs*, *Hyſterical Illneſs*, *Falling Sickneſs*, *Dull Sight*, *Melancholy*, *Bilious*, *Hæmorhages*, *and Putrifications of the Mouth* (*o*), *as* Sir *John Floyer* informs us. The ſame Author tells us, he hath often put by his *Aſthmatic Fits* by drinking Water, and certainly nothing is leſs flatulent than Water, having leſs *Air* contain'd in its Pores than any other Liquor we uſually drink, as *made Wines* almoſt of all ſorts have the moſt; for which Reaſon they are ſo offenſive to weak Stomachs; for being heated in the

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(*o*) *Treatiſe of Aſthma*, p. 176.

Stomach, the *Air* contain'd in 'em unfolds its Spring, and forces its Way thro' its upper Orifice in belching, if the Fibres of the Stomach be not very ſtrong. Beſides this, this windy ſort of Liquor conveys greater Quantities of *Air* into the Maſs of Blood, which will ſo *rarify* and expand it, as to produce all thoſe Diſorders that Water drinking is ſo proper to prevent.

§ 7. Our common Spring Water wou'd perform many of the Cures done by Mineral Waters, cou'd they be taken in the ſame Quantity without any Inconvenience, being their Effects upon a humane Body are moſtly ſuch as are owing to ſome obvious Property in Water, ſuch as *diluting* the Blood, *diſſolving* its ſtimulating Salts, *curbing* its Motion, *abating* its Heat, *ſhutting* up the too patent Pores of the Skin, *ſcouring* the Stomach and Urinary Paſſages, *&c.* But great Quantities of Water would relax the Fibres of the Stomach, and ſpoil both Appetite and Digeſtion, were it not for the *Stipticity* of Mineral Ingredients, which gives thoſe Waters an Advantage above others: Beſides, their Salts may be a Means of carrying them further into the Habit of the Body, and enable them better to open Obſtructions than common Water would, and their Salts being *Vitriolic* in all theſe called *Chalybeats*, may give a better Conſiſtence to the Blood, grown too lax in Hypochondriac and Scorbutic Bodies.

The great Advantage that *Bath* Water has, above others, in reſtoring the loſt Appetites of old Debauchees, is owing to its actual Warmth, which makes it ſo agreeable to Stomachs accuſtomed to hot Liquors; its Heat makes it more agreeable in the Cholick, tho' the Cure is perform'd by what is common to other Waters, for Water-Drinkers are never troubled with this Diſtemper. I have known ſome cur'd by drinking Water, after all other Means they've try'd have prov'd unſucceſsful, and upon their drinking fermented Liquors, their Pains have return'd, which they have cur'd again by repeating their former Experiment.

§ 8. The fermented Liquors commonly in Uſe in this Kingdom, are *Ale*, *Beer*, and *Wine*; and there is this common to 'em all, when they are thoroughly fermented, *viz.* That they Heat, Intoxicate, force Urine, aſſuage Hunger, excite Thirſt, Stupify, and promote Perſpiration, when taken in great Quantities.

ties. They are lighter, and leſs glutinous than either *Wort* or *Muſte.* Theſe afford more Oil and fix'd Salt by Diſtillation, both being in a great Meaſure turned into Spirits in the other; ſo that fermented Liquors contain a great deal of *Sal Volatile Oleoſum* in them, by which they become agreeable to the Stomach, by making a gentle Titillation upon our ſenſible Fibres and Membranes, and cauſe an univerſal Relaxation through the whole *Animal Syſtem.* The Blood will, by this Means, have a great Impediment to its free Circulation removed, the Diameter of all the Arteries being inlarged, a larger Cylinder of Blood will paſs through them without touching their Sides, from whence the reſiſtance proceeds, the Arteries being Conical, and therefore will move with greater Celerity, and conſequently increaſe the Quantity of perſpirable Matter and Urine, (*by the 20th Propoſition of Secretion*) as alſo Heat and Thirſt, as I've proved in the Chapter of *Acute Diſtempers.* Hunger being an ungrateful Senſation, they abate that by making a pleaſant one, and all the Symptoms of Drunkenneſs may be accounted for, from an univerſal Relaxation. Moreover, this *Sal Volatile Oleoſum* of fermented Liquors, entering into the Maſs of Blood, diſſolves, rarifies, and expands it, whereby all the forementioned Effects are more eaſily brought about; and when the Rarefaction is exceſſive great, the diſtended Arteries intercept the Paſſage of ſo many Spirits into the Heart, as to render it unable to contract itſelf, with Force enough to drive the circulating Blood to the Extremity of the Body; for which Reaſon, People that are very drunk are *pale.* From hence we may infer, not only the Safety but Neceſſity of Blood-letting in this Caſe, both when the Pulſe is almoſt inſenſible, and the extreme Parts cold. In this drunken Condition a vaſt Quantity of Blood is thrown into the Brain, and thoſe Parts neareſt to the Heart, whereby the Tone of their Fibres are deſtroy'd, (eſpecially if Drunkenneſs be often repeated) and become ſo weak, as not to be able to carry on the Circulation of the Humors; for which Reaſon hard Drinkers will be ſtupid, and ſubject to *Appoplexies*, *Palſies*, *Vertigo's*, Loſs of *Memory*, Trembling of the *Hands*, Loſs of *Appetite*, a bad *Digeſtion*, *Tumors* of the *Liver*, *Spleen*, or *Meſentery*; from whence proceed the *Jaundice* and *Dropſy*,

Dropſy, the common Fate of moſt great Drinkers. Now ſince theſe Diſtempers are the Effects of Drunkenneſs, and brought about after the Manner aſſign'd, we may hence learn what Sort of ſtrong Drink is the ſafeſt to be drunk in great Quantities. It muſt be ſuch as is clear and tranſparent, and has a dry Pungency upon the Tongue, by which Means it will beſt paſs off by Urine and Perſpiration. It ſhould alſo be ſuch as has the leaſt relaxing Property; for which Reaſon the gentle *Stipticity* there is in *Claret*, renders it generally the moſt wholſome to be drunk plentifully of any ſtrong Liquor whatſoever, the great Quantity of *Tartar* contain'd it, prevents it both from relaxing the Stomach, and rarifying the Blood, ſo much as other ſpirituous Liquors do.

Though Exceſs in ſtrong Liquors be ſo prejudicial, yet the moderate Uſe of them are often of great Advantage; and certainly they are great Bleſſings to Mankind, in as much as they are ſo very uſeful in ſeveral Caſes, when our Spirits are almoſt exhauſted by violent Exerciſe, or hard Labour, or ſunk by Pains, Sickneſs, or Perturbation of Mind. How comforting is a Glaſs of ſome grateful ſpirituous Liquor?

quor? It blunts the Senſe of Pain, exhilerates the drooping Spirits, baniſhes Melancholy, ſatisfies hunger, when Victuals are not to be had; 'tis uſeful in all Diſtempers where the *Pulſe is low*, where the Blood abounds with Serum, where Perſpiration is ſuppreſſed, and when the Paſſions of the Mind are violent; for which Reaſon the Hypochondriac, the Hydropic, and ſuch who have newly taken Cold by a Suppreſſion of Perſpiration, ought to drink ſtrong Drink in a moderate Quantity. Nay, 'tis beneficial in Fevers, where the Lowneſs of the Pulſe, the Dejection of the Spirits, and the Coldneſs and Dryneſs of the Skin indicate it. Though it muſt be confeſs'd, that 'tis but few Caſes in which a cool Regimen is not the moſt proper.

Wine is generally the moſt agreable to the Stomach, of any Kind of fermented Liquor whatever, both on Account of its *Clearneſs*, and of the *Tartar* contained in it: *Tartar*, or ſome of its Preparations, being more grateful to the Stomach, in all its Diſorders, than any other Medicine; for theſe Reaſons it is that *French* Wines, eſpecially thoſe of *Burgundy* and *Champaign*, are preferable to thoſe of *Portugal*, *Spain*, or any of the ſweet Wines, except when we would drink them as a Cordial, in little Quantities. Theſe laſt, tho' they taſte much ſtronger, and oppreſs the Stomach, and diſorder the Head more than the other, do yet afford much leſs Spirit by Diſtillation; their Fermentation being more imperfect, their oily Parts are unconverted into Spirits, which appears by diſtilling them; for they afford more Oil than the other, and 'tis this half fermented Oil that makes them more difficultly digeſted, more nouriſhing for the Body, and fitter for Men of a dry Conſtitution. 'Tis to ſuch that Ale is more agreable than Wine, being more ſoft, ſmooth, and ſlippery, and conſequently more *nouriſhing*, and fitter to relax the too tenſe and dry Fibres in ſuch a Conſtitution. But in general, the nearer our *Malt-Drink* approaches to the Nature of Wine, the better it is; therefore it ſhou'd be made of clear Water that will bear Soap, be well *Hopp'd*, that it may keep till all the groſs viſcid Parts are fallen to the Bottom of the Veſſel. It ſhould have a dry Taſte, without Sourneſs, and be tranſparent, ſhould ſparkle in a Glaſs, but the ſmaller the Bubbles are the better. That *Hopping* of Drink is neceſſary, is evident from this, that without

Hops, we muſt either drink our *Beer* and *Ale*, *new*, *ropy*, and half *fermented*, or elſe *old* and *ſtale*, both which are very prejudicial to our Health. Nay, *Hopp'd* Drink is beneficial even in the *Stone*, as I have oft experienc'd, tho' the common Opinion be againſt it. *Hops* are a grateful Bitter, and therefore a good Antidote againſt both *Stone* and *Gout*, according to the Obſervations of (*p*) *Sydenham* and (*q*) *Waldchmiedt*; and if they be not prejudicial in the Stone, there is few Caſes in which they will be condemn'd. Tho' it muſt be own'd, that they, as well as all other Bitters, are improper for Perſons of a *hot* and *choleric* Conſtitution.

(*p*) Opera Univerſa, *p.* 418, 419 *and* 526.
(*q*) De Calc. Ren. & Arth. inter. Monita Medica.

A
TREATISE
OF THE
LIVER, &c.

THE Liver may well be called a conglomerate Gland, as it is made up of ſeveral leſſer Glands commodiouſly tied together, who empty themſelves all into one common excretory Duct: It is ſeat-ed in the uppermoſt part of the lower Belly, immediately under the Diaphragm in the right Hypochondrium, which it almoſt wholly fills, and from whence it is extended beyond the Cartilago Enſiformis over the right Side of the Stomach, towards the left Hypochondrium; and where, towards its Extremities, it becomes ſenſibly narrower, and thinner; thereby, upon Occaſion, to give the more room to the Stomach in its Diſtenſions.

Its gibbous or convex Side is contiguous to the Buſtard, or ſhort Ribs on the right Side; as alſo to a great part of the Diaphragm.

Its hollow or concave Superficies towards the left Side, covers the Pylorus and the upper part of the Stomach, and alſo a part of the Omentum; but by the Interpoſition of the Gall-bladder, which for the moſt part lies between the Liver and the Stomach, near the Pylorus, as ſhall afterwards be deſcrib'd. On the right Side it is extended to the right Kidneys, and covers a part of the Colon, and alſo the whole Duodenum, and ſome parts of the Jejunum and Omentum.

The Liver in a ſound Man ſtanding upright, hangs down below the ſhort Ribs, almoſt as far as the Navel. In morbid Livers, its Bounds are oftentimes much farther extended, both beneath the Navel, and towards the left Side, to the ſhort Ribs.

When theſe Tumors proceed from Cauſes that equally diffuſe themſelves thro' the whole Subſtance of the Liver, and encreaſe this Bowel according to all its Dimenſions, they may be eaſily diſtinguiſh'd from thoſe of the neighbouring Parts, upon Examination; becauſe they always carry along with them the Figure of the Liver.

The Liver is likewiſe incident to particular Tumors both in its concave and convex Side, where the Cauſe is not ſo univerſal, as to extend it ſelf over the whole Liver.

Thoſe in the concave Superficies, are not ſo plainly to be known, as when they happen in the convex Side; but may be concluded from the unuſual fulneſs and hardneſs in the right Hypochondrium (the Seat of the Liver) together with the outward Colour of the Skin, which is uſual for thoſe to have, that labour under a diſeas'd Liver.

Thoſe in the convex Side, are nearer and more ſuperficial, and are eaſily to be come at ; which you may feel by your Hand, if you gently direct it along between the ſhort Ribs, the Cartilago Enſiformis, and the Tumor.

Theſe Tumors, as we have obſerv'd before, will be ſometimes extended to the ſhort Ribs of the left Side, which may impoſe upon the Incautious, who may take them for Tumours of the Spleen, but are diſtinguiſhable enough ; for they lie more ſuperficially, and upon the Stomach, than thoſe of the Spleen can ; unleſs in very extraordinary ones, which will plainly diſcover their Seat themſelves by their unuſual Bulk, by the extraordinary Diſtenſion and Weight in the left Side ; and laſtly becauſe thoſe of the Spleen will appear much deeper than they can be.

The Ligaments which keep the Liver in its due Place and Situation, are chiefly three.

The firſt ties it to the Diaphragm, and is called *Ligamentum Suſpenſorium* ; becauſe by the Aſſiſtance of this the Liver is principally ſupported, which otherwiſe, by reaſon of its great Bulk and Weight, would in an upright Poſture fall down lower than it ſhould do.

This Ligament is not only barely fixt to the outward Membrane of the Liver, but enters its very Subſtance ; and is likewiſe ſtrongly tied to the *Capſula Communis* there, where the *Vena Umbilicalis* is contiguous to it, and which makes the ſecond Ligament ; which tho' it be not always clos'd, yet after the Birth, has the uſe only of a Ligament, as before it had that of a Vein.

It has its Terminations, one at the Fiſſure of the Liver, as was before obſerv'd, and the other at the Navel: This keeps the Liver from preſſing too much upon the Diaphragm.

The third Ligament; which is deſcrib'd by Authors to tie the Liver to the *Cartilago Enſiformis*; and to be a ſtrong, broad, thin Membrane hanging looſe, and ariſing (according to *Spigelius*) from the Membrane that cloaths the Liver; and according to *Gliſſon*, is a Duplication of it only, appears in truth to be nothing elſe but a Continuation of the *Peritonæum*, or at leaſt to ariſe from the *Peritonæum*, as the *Mediaſtinum* does from the *Pleura* in the middle Cavity; where from the *Cartilago Enſiformis* taking its Courſe to the Liver, it connects one to the other; running farther along to the Diaphragm, it joins likewiſe to the Liver, in its gibbous and upper part all along from the left Side to the right. This Connection that it has with theſe Parts by the Continuation of the *Peritonæum*, muſt needs keep the Liver from fluctuating towards the right or left Side, or backwards.

Beſides theſe aforemention'd Ligaments, the Situation of the Liver is preſerv'd by ſeveral other Connections; which cannot properly have the Name of Ligaments; and under this Conſideration comes the *Vena Cava*, as alſo the *Vena Porta*, by Means of which it may be ſaid to be tied to the Meſentery, Inteſtines, Stomach, Omentum, Spleen, and Pancreas: The *Porus bilarius* likewiſe ties it to the *Duodenum*, and ſometimes the *Jejunum*; the hepatick Artery to the cœliack, and the Nerves belonging to it to the Intercoſtals.

Theſe ſeveral Connections, as they moſt of them contribute to preſerve the Liver in its proper Place; ſo many of them ſhew the neceſſity there is that it ſhould be ſo ſecur'd from the Danger which muſt enſue from its being diſplac'd.

But it is not ſo entirely fixt as always to keep in the ſame Poſture; for it is manifeſt it alters that oftentimes, as we do that of our Bodies; which may be demonſtrated by marking its Tumors with Ink; for then, upon changing the Poſture of the Body, the Tumor will leave the place ſo mark'd.

That this cloſe Connection of the Liver with the Diaphragm, muſt oblige it to follow its Motion, is likewiſe a neceſſary Conſequence. Thus in Inſpiration, when the Diaphragm contracts it ſelf in order to elevate the Thorax, it is with the Liver carry'd down farther into the Abdomen; as in Exſpiration, when the Diaphragm is relaxed in its turn, and is driven higher into the middle Cavity, the Liver goes along with it in the ſame Action.

This will be an Inſtruction to Phyſicians, who are to examine the State of the Liver, to let it be in the Act of Inſpiration; for then the Liver being thruſt down farther into the Abdomen, it is much eaſier to be come at, and more diſtinctly to be felt.

As in the natural State the Liver ſhould always be ſubſervient to the Motion of the Diaphragm; ſo in a preternatural one, it oftentimes mightily incommodes it, both by diſorders of its own, and alſo by ill Offices done to it by the neighbouring Parts.

Thus the Liver being upon any Accident grown bigger, it induces a Difficulty of Breathing; a Symptom frequently obſerved in rickety Children, whoſe Livers are oftentimes larger than ordinary.

The Liver ſometimes will grow to the ſhort Ribs, which is the Diſtemper with us, I preſume, call'd Liver-grown, and which of Neceſſity muſt be a very great hindrance to Reſpiration.

In Diſtenſions of the Stomach likewiſe, by Meat, Drink, or Wind, the Liver is thruſt upon the Diaphragm, and ſo checks its Motion. Diſtenſion of the Colon, the ſmall Inteſtines, and in ſhort of any part that lies upon the Liver, will crowd up the Diaphragm into the Thorax, and ſo rob it of that room it wants, to perform the Act of Reſpiration in, as it ought to do.

The Liver, as to its Bulk, is very different in different Bodies; in Fætus's it is much larger, than in adult Perſons, in proportion to the reſt of the Body. But as the learned *Gliſſon* obſerves, it is leſs in Eunuchs, than in Men not caſtrated; in Capons, than in Cocks; in Water Animals than in thoſe that live upon the Land. But not being ſufficiently convinc'd of theſe Matters of Fact, and that this great Author might be miſtaken in his Obſervations; I ſhall reſpite the Conſideration of them, and only in general take Notice, that a more ſluggiſh than ordinary Circulation, even where there is no Indiſpoſition of the circulating Fluids, will increaſe the Bulk of the part where it happens; that is, if the circulating Humours are not carried away with that Velocity they are brought thither; for then the Veſſels will be diſtended; and conſequently this Bowel where the Veſſels make up ſo great a part of its Subſtance, will be ſo too, and it may be without much Injury to it; as we ſee our Hands will ſwell with Cold: Which Inſtance ſo far agrees with us here, that the Circulation is retarded, and which occaſions the Swelling without any great Inconvenience.

We are farther to conſider, that this Bowel abounds very much with Blood; for all the Blood that is ſent to the Stomach, Inteſtines, Spleen, Pancreas and Meſentery by the great Artery; namely, the cœliack, ſuperior and inferior Meſenterick, in order to its return to the Heart, is taken up by the Roots of the *Porta*, to be tranſmitted thither; and which therefore, upon the leaſt Stop, will be apt to diſtend the Liver, as it paſſes thro' it, and be apt, as it were, to over-nouriſh it.

And under this Conſideration, Tumors of all kinds will come; ſuch as any way indiſpoſe, and make the Liver uncapable of performing the Office appointed it by Nature.

Thus the Liver is liable to Inflammations, which here are of the ſame Nature, and proceed from the ſame Cauſes, that Inflammations in all other parts of the Body do; and may be defin'd an Effuſion, or Extravaſation of the Blood thro' the Subſtance of the Liver, which is cauſed either from the Thickneſs or Viſcidity of the Blood, which makes it uncapable of circulating through the Capillaries of this Bowel; or elſe from the Turgeſcence of the Blood in the Veſſels, where by reaſon of its great Motion and Expanſion, and Rarefaction it breaks thro' the Capillaries; or elſe from Contuſions by outward Violences. In all which Caſes the Courſe of the Blood is check'd; and the Blood not being able to be carried forwards, Diſtenſions in the Parts that hold it muſt ariſe, and the Conſequences may eaſily be apprehended, *viz.* by a weight and heavineſs in the right Hypochondrium, and troubleſome Pain, a Fever, with a difficulty of Breathing, which are the Symptoms of the Inflammation of the Liver.

This Pain is in a particular manner to be diſtinguiſh'd by the ſick Perſon's turning himſelf from one ſide to the other ; which, as it is more in the Subſtance, or in the Membranes, is more or leſs acute. The Subſtance of the Liver, being much leſs ſenſible than the Membranes of it, ſuffers not ſo much under theſe Diſtenſions.

In theſe Inflammations of its Membranes, the Pain will run all along the *Pleura*, which makes it ſomewhat difficult to diſtinguiſh it from the Pleuriſy

Our Hints, in theſe Caſes, we take either from the Pain, which is not altogether ſo violent here, *Cæteris Paribus*, as it is in the Pleuriſy ; neither is the Pleuriſy attended with that weight or ſwelling in the right Hypochondrium, which is the Seat of the Liver. Beſides, the particular Complexion, or Colour of the Face, which for the moſt part in all Diſeaſes of the Liver, is Icterical,

rical, ſhews the Diſeaſe, and from whence theſe Symptoms take their riſe. It is a Diſeaſe of a very bad prognoſtick always, as may eaſily be imagin'd. But more ſo when it happens in the gibbous or convex part of the Liver, than in the concave, as is obſerv'd by Practitioners: And the Reaſon is plain, that it is ſo from the cloſe Connection it has with the Diaphragm in its convex Superficies, whereby it readily communicates its inflammatory Diſpoſition to each part; the Danger of which is plain from the uſe the Diaphragm has in Reſpiration.

Whenever theſe inflammatory Tumors happen, the ſafeſt way is to diſcuſs them, if it be poſſible; but if that is not to be brought about, we are to promote Suppuration by all the means we can. The Diſeaſe then takes another Denomination, and is call'd an Abſceſs; which is made by the Converſion of theſe extravaſated circulating Humours into *Pus*.

As when this purulent Matter has by its Acrimony corroded, and made its way thro' the parts that contain'd it, it takes the Name of an Ulcer.

The Colour and Conſiſtence of Matter diſcharg'd from it, gives us this Prognoſtick, that if it be white and well digeſted, there is Hopes of a Cure; but if it be red, fœculent, and fœtid, there is but little Expectation to be had from ſuch a Caſe.

Having given an Account of the hot and inflammatory Tumors of the Liver, and the Conſequences of them; the cold ones will come next to our Conſideration; and they have their Seat either in the very Subſtance of the Liver, or in its Veſſels or Membranes, or in two, or all theſe together.

Under the firſt Caſe falls the ſchirrhous Tumors of the Liver; where its whole Parenchyma is turgid, with a ſerous watry Humour, which like a Sponge it ſeems to have ſuck'd up. The Veſſels and Coats are relax'd in their Tone, and being fill'd and nouriſh'd with this depauperated Blood, want that Vigour they ſhould have; which when it ſo happens, they will in time be the Cauſe of a Dropſy: And this Diſtemper will have its firſt Seat here; as oftentimes it is produc'd elſewhere, but afterwards by the Blood it communicates its Impreſſions to this Viſcus.

The Ancients aſſigning to the Liver the Office of Sanguification, look'd upon it to be the chief Cauſe and Seat of the Dropſy. They were farther confirm'd in this Notion of theirs from the Obſervations they made, that all Diſeaſes of the Liver, if let run to any height, terminated in the Dropſy; and which indeed ſhews that the Liver has oftentimes a great deal to do in this Diſtemper; yet not as a Bowel of Sanguification, but as a part through which a great Number of Blood-Veſſels take their Courſe; and where the circulating Humours contained in them, may meet with Obſtructions; which Humours being ſtill more plentifully ſent by the Heart, and the Liver not being able to carry them forwards,

wards, or at leaſt with the ſame diſpatch they are brought; either from its own Indiſpoſition, or that of the Blood, the watry parts of the Blood in theſe Diſtenſions and Weakneſſes of the ſolid parts, tranſude thro' their Pores, which being juſt by them alter'd into a Body, conſtitute this Diſeaſe.

To make this the more intelligible, this following Experiment may ſerve, *viz.* by making a Ligature in the *Vena Cava*, between the Diaphragm and the Heart; for then the Blood which is ſent from the Heart by the great Artery, not having a Paſſage to return to the Heart, the Veins will be diſtended, and the watry ſerous part of the Blood will make its way thro' the Veſſels; and in an Hour or two's time, we ſhall ſee a great Plenty of extravaſated Serum in the Cavity of the Abdomen.

That Obſtructions in the Liver, or any other part, may in proceſs of Time, bring about what by a Ligature is effected in an Inſtant, is, I think, intelligible enough.

The Liver has likewiſe, as was before obſerv'd, its particular Tumors; that is, where their Cauſes do not equally diffuſe themſelves thro' the whole Subſtance of it. And they have likewiſe their Original from ſome Obſtructions either in the Blood-Veſſels, or the bilious Ducts, or from both.

We do not mean by Obſtructions here, a total Stop of the Circulation of the Humours thro' the Liver; for ſo it would not be conſiſtent with Life; but ſuch a Diſpoſition of theſe Humours, as to render them unfit, and indiſpoſed

diſpoſed for a free progreſſive and circular Motion; whereby they move ſo ſlowly, that their Motion reſembles a Stagnation. And here I take it to be in ſome Veſſels eſpecially, the reſt being free enough to perform tolerably the Buſineſs of Circulation.

Stones, Ulcers, and ſchirrhous 2
Tumours, as they proceed from theſe Indiſpoſitions of the Fluids, ſo they will aggravate the Cauſe of theſe Obſtructions. But the moſt frequent Cauſe is the thick and viſcid Conſtitution of the Blood, which being loaden with a too viſcid Lymph, or ſaline coagulating Particles, loſes that Acidity that it is neceſſary for it 3
to have, to be able to run thro' the ſlender capillary Veſſels of the Liver; and ſo is the Author of Obſtructions in the part where it ſtays.

The Bile likewiſe being after this manner thicker than ordinary in its Conſiſtence, frequently produces Obſtructions. For by this means it being uncapable of being taken into the ſlender Capillaries of the biliary Ducts, it there ſtagnates; and being again received into the Blood either by the Roots of the *Vena Cava*, or the lymphatick Veſſels, there follows the Diſtemper call'd the *Jaundies.*

Which, according to the Colour it tinges the Habit of the Body with, has the Denomination of the yellow and black *Jaundies.*

That the *porus biliarius*, or *Meatus Choledochus* may be obſtructed by a glutinous and too viſcid Bile, is not ſo conceiveable; as by Tumors, Stones, *&c.* which do it by preſſing upon them, which has been diſcover'd by *Autopſy* to be a Truth.

But that the ſlender Capillaries of theſe bilious Veſſels may be unable to tranſmit that Bile that is brought to them, gives no Difficulty to our Apprehenſions. The Method we take to cure theſe Diſorders, proves as much, which is effected by attenuating Medicines; which as they open Obſtructions, ſo they render the Fluid more liquid by their deobſtruent Quality; according to the Obſervation in Practice that thoſe Medicines which facilitate the Secretions or Separations to be made in the Blood, do likewiſe diſpoſe the Colatures to the better Performance of their Duty.

But many are of Opinion, that Obſtructions alone are not ſufficient to cauſe this Diſeaſe; and alſo that it may happen without

Obſtructions. To prove this firſt Aſſertion, they give us Inſtances of Perſons labouring under Obſtructions; as Chloretic and Hypochondriac Perſons who have no Jaundies, and therefore that Obſtructions alone are not ſufficient. But here they ſhould likewiſe have prov'd that the Liver was not obſtructed in theſe their fancied Obſtructions.

To prove the latter, *Sylvius* from *Autopſy*, brings Inſtances of Icterical Bodies that he had diſſected, where there were no Obſtructions to be met with: And to ſtrengthen this Notion, the biting of Vipers, which are own'd by all Authors to give riſe ſometimes to the *Jaundies*, and which in ſo ſhort a time can hardly be ſuppoſed to make ſuch Obſtructions, is a farther Argument.

This Effect may be imputed to

a fermentative diſſolving Humour, which by the Biting, the Viper has communicated to the whole Maſs of Blood; and which by its great Activity and Power it has of diſſolving the Blood, renders it more bilious: The Bile and the red part of the Blood poſſibly differing in nothing elſe but in its greater or leſs Attenuation.

Paſſions will produce the ſame Effect. I have ſeen a Child's Skin, upon eating of Garden Nightſhade-Berries, ting'd all over with yellow; which from the Cure it ſo readily received, cannot be thought to have proceeded from Obſtructions.

Theſe Inſtances given, encourage us to divide the *Jaundies* into a Diſeaſe that owes its Original to a hot as well as a cold Cauſe; to the great Attenuation and Fluidity of the Bile, as well as Viſcidity, the Author of Obſtructions.

This Diſtinction may be of Service to us in the Method of Cure of the *Jaundies*; which, as it proceeds from different Cauſes, the Method of Cure muſt likewiſe be diverſified; for otherwiſe the Phyſicians treating all Icterical Perſons alike, muſt oftentimes be diſappointed of their Aim.

The Liver, as it is a glandulous Body, is a proper Seat for ſchirrhous Tumors; which here, as in other parts of the Body, are hard Tumors, reſiſting any Impreſſion made upon them; and when exquiſite, are without Pain, tho' at their beginning, before they are confirm'd, they will have Pain. Theſe Tumors frequently ariſe from the Matter of them, being inſenſibly, and in proceſs of Time, accumulated in the Liver; tho' they are likewiſe the Conſequences of Inflammations, where the thinner parts of the circulating Humours being evaporated, the remaining thicker Matter became the original Cauſe of a ſchirrhous Tumor; and this, it may be, in the very Glands of the Liver; a pretty plain Inſtance of which, I think, we have in *Gliſſon*, which he had from *Regemorter*, who, upon diſſecting of the Body of one, who, in his Life-time, was for ſeveral Years troubled with ſtrumous Swellings in his Neck, he found his Liver to be all over ſtuff'd with Glands of the bigneſs, ſome of a Pea, others of Beans, which being cut, contained nothing liquid in them: But, as in Figure, ſo in Subſtance, they exactly reſembled Glands, compounded, as he deſcribes them, of a Clay-coloured pituitous Subſtance.

Theſe Glands had ſo encreaſed the Bulk and Weight of the Liver, that it was twice or thrice as big as naturally it ſhould have been.

The Lymph being ſometimes extravaſated, will make a peculiar Coat of its own, and be contain'd as it were in a *Cyſtis* ; and which, according to the Conſiſtence of the Matter of the Tumors, bears ſeveral Denominations.

Thus, if the Matter be pretty much of the Conſiſtence of Honey, they are called *Meliceriedes* : If it be ſtill coagulated into a harder Subſtance, they are called *Atheromata* : And if it be yet harder, and have a Conſiſtence as firm as that of Suet, they are called *Steatomata.*

Inſtances of theſe kinds of Tumors are to be met, tho' rare: And one I ſhall relate to you from the abovenam'd Author, Dr. *Gliſſon*, in his elaborate Treatiſe of the Liver, which is remarkable enough; and that is of the *Atheromatous* kind, which was found in the convex and gibbous part of the Liver backwards, near to the Diaphragm, in the place where it is perforated by the *Vena Cava.* The Figure of it was round, and near as big as one's Fiſt; and being freed from the Liver, it weigh'd five Ounces, ſix Drachms, and thirteen Grains. Its Coat or *Cyſtis* was almoſt as thick as the *Cutis*, and contain'd in it Matter or Subſtances of two ſorts; both of which were very thick in Conſiſtence, and not at all Fluid: One was tranſparent like to Jelly, the other look'd like a thick Cream. In this Body the Liver was larger than uſual; as alſo were the Veins of the Meſentery, Inteſtines, Stomach, and particularly the Spleen. Which could only happen from the preſſure of this Tumor upon the capillary Blood-Veſſels in the Liver; whereby they became ſo ſtreightened, as not to be in a Condition to give that free Conveyance of the Blood they do in its Circulation; and which therefore not only influenced all the Veſſels of the *Porta* within the Liver, but alſo all thoſe that fed the *Porta*, which by this Stop given to the Circulation, diſtended them by this over-load of Blood; and which, as was before obſerv'd, will be the Conſequence in any part, where the

Blood is brought with too great Impetuoſity, or in ſuch Quantities as it cannot be carry'd as readily away.

The Liver is likewiſe incident to watry Tumors, call'd *Hydatides*; which are pellucid Bladders diſtended with *Serum*: And they appear to be the very Membrane of the Liver, raiſed from its Subſtance by this ſerous Humour. Theſe, according to the Liquor they contain, are ſometimes as large as one's Fiſt, and oftentimes leſs; ſometimes fewer, and ſometimes more in Number, and that both in Men as well as other Animals. If theſe by any Accident are at any time broken, the Water contained in them falls into the Abdomen; from which a Dropſy muſt certainly enſue.

In Sheep that die of the Rot, as it is generally phras'd, we oftentimes meet with Tumors almoſt peculiar to them in the Body of the Liver; in the middle of which there is a Cavity full of Water, and which likewiſe contains Worms in it.

The Liver is ſingle, and but one; and in Men but one continuous Body; tho' in Quadrupeds and ſeveral Birds, it is divided into Lobes. The convex Superficies of it is very ſmooth, but its concave is more uneven; and beſides that great Fiſſure where the *Vena Umbilicalis* enters it: And which has created, in my Opinion, that needleſs Diſpute about the Diviſion of an human Liver into Lobes.*

It has three *Sinus*'s, as they are call'd by ſome, or Impreſſions made, as I conceive, by the parts it lies upon; the largeſt of which is in the left Side, where the Liver lies upon the right Side of the Stomach, the *Pylorus*, and a part of the *Inteſtinum Duodenum*. The ſecond is in the right Side near the lower part, and contains almoſt wholly the Gall-bladder. The third is in its upper part, where the *Vena Cava* goes out of the Liver. Theſe are the moſt remarkable Cavities; and though there are ſeveral other Impreſſions made upon it by the adjacent parts, yet they are of that ſmall Conſideration, as not to deſerve our farther Notice.

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* Vid. Dr. *Drake*'s Anatomy, *p.* 100, *&c.* Edit. ult.

I think it may with Safety be affirm'd, that all Animals have always a Liver, and but one, notwithſtanding theſe following ſtrange Hiſtories, which I am going to relate to you, whoſe Veracities are not much to be rely'd on.

The firſt is from *Zacutus Luſitanus*, in his Book *de Prax. Medica Admiranda*, in the 38th Section, on, which communicates the Obſervation of a Woman, who, upon Obſtruction of her *Menſes*, had fallen into a Tympany, of which ſhe dy'd; in whoſe Body, upon Examination, there was no Liver to be met with, he ſays, but in its ſtead a great Maſs of Fleſh, or a filthy Subſtance of great Bulk, extended from the Region of the Liver, down to the Navel, which being taken out and weigh'd, the Weight of it amounted to ſix and thirty Pounds.

The ſecond is from *Skeuckius*, in his third Book of Obſervations, and the ſecond Section; and that is of an *Antwerp* Merchant, in whoſe Body, upon Diſſection, there were neither Liver nor Spleen to be ſeen. But the Inteſtines were in Subſtance altogether carnous, and much more ſolid than the muſcular Fleſh generally

nerally is. It was almoſt as firm, he informs us, as that of the Heart. The *Vena Cava* had its riſe from the Inteſtines, after the ſame manner the *Vena Porta* uſes to have in other Bodies. This Man, in his Life-time, was very liable to Inflammations, and Abſceſſes in his Inteſtines, and for ſome time before he dy'd, had labour'd under a Dropſy.

The third, *Skeuckius* barely relates from *Gemma*: And that is of one who had two Livers. But there being no mention made of this Subject's having two Gall-bladders, two excretory Ducts, two *Vena Cava*'s, and two *Vena Porta*'s, we may favourably conclude, this Author might, without any Pleaſure he had of telling a ſtrange Story, miſtake a Liver unuſually divided, and as there are Accidents and Luſus's in Nature, for two Livers. Nor might the Miſtake of the former Anatomiſts be leſs, who from the odd and unuſual Situation and Configuration of the Liver, fancy'd it not to be at all.

However, it muſt be confeſs'd, that theſe are very extraordinary Inſtances; tho' not concluding that any Perſons can live without a Liver, or ſome ſuch Organ for the Separation of Bile.

This red Colour that it ſhews it ſelf here to us with, is not its proper Colour, but is wholly owing to the Blood it has within it, which we may, by Injections of Water, ſo clear it from, that it will become white.

It is cloathed with a thin Membrane, whoſe Origin ſome will have to be from the *Peritonæum*. But, in my Opinion, the *Peritonæum* may be ſaid as well to be from this Membrane; they being form'd in the Fœtus at the ſame time. And farther, when Chops or Fiſſures happen at any time to the Liver, and that this Membrane is broken, Nature effects the Cure by bringing a new Skin on the Lips of the Wounds on both Sides; the Matter of which is brought by Veſſels of its own, and none belonging to the *Peritonæum*.

It may be ſeparated from the Subſtance of the Liver, but hardly without taking ſome of its Subſtance along with it.

The Uſe of this Coat is to protect the Liver againſt any Injuries that might be offer'd to it by the neighbouring Parts; and to keep it whole, and together; which is of it ſelf a Subſtance very friable and brittle. And that ſuch a Cure was neceſſary, muſt be concluded, as well from the ſafe Paſſage its Subſtance is to give to all the Blood, which is brought to it by the *Vena Porta*, from the Spleen, Pancreas, Omentum, Meſentery, Inteſtines, and Stomach, as alſo becauſe by it are to be made the Separations of the Bile. So that, whenever there is a Solution of this Continuity, *viz.* a Breach made by any Accident; in this part the Bile can be no longer ſeparated from the Blood, but mix'd together, muſt ſtagnate.

The Cauſes of theſe Solutions are either Wounds, Contuſions, or Corroſions by ſharp Humours; Obſtructions, of which before, and Inflammations, are taken Notice of by ſome Practitioners. And ſometimes in Wounds and Concuſſions of the Brain, there has been found an Impoſthume of the

Liver; which is mention'd by *Job à Mekreen*, in his *Obſervat. Medic. Chirurgic.* Obſervat. 1.

They proceed (according to them) from thick Flatus's, which are kept in by this outward Coat, and ſwell and inflate the Liver; and by diſtending the Membrane, create that Pain complained of in this Caſe.

The *Dignoſticks*, to know this Diſeaſe by, they tell us, are from a Swelling in the right Hypochondrium, accompany'd with very great Pain, which yet is not continual, but is ſometimes greater, as at other times leſs; and carries not that Heavineſs or Weight along with it, that other Tumors of the Liver do, and which, if preſs'd upon with one's Hand, do readily give way without any Noiſe or Appearance of Fluctuation, to give any Umbrage for ſuſpecting an Abſceſs there.

I confeſs, it is not impoſſible, but Wind may be gather'd here, ſo as to divide and ſeparate this Membrane from the Subſtance of the Liver, as well as ſerous Humours, which is oftentimes known ; yet probably, they are oftner Diſtenſions of the neighbouring membranous Parts, which might, from their nearneſs of Situation, be miſtaken for thoſe of the Liver. For I don't recollect any one Inſtance, where, upon Diſſection, the Liver was ever found ſo inflated. And it is farther own'd, that in theſe Caſes, the Colour and Complexion of the Face and Skin is not ſo alter'd, as it uſually is in other Diſorders of this Bowel.

The Danger that muſt enſue from the Wounds of the Liver, its Contuſions and Corroſions, may eaſily be apprehended ; as that when they happen in the Veſſels, they are ſtill worſe than when in the Subſtance ; tho' for the moſt part they are both together affected. Yet there are Inſtances to be met with, even where Wounds have been cur'd; though poſſibly, not one in a thouſand can eſcape. And to this Purpoſe *Hildanus* mentions one who recover'd, after a part of his Liver had been cut out from the Wound he had receiv'd, and where the Patient ſuffer'd very ſevere Symptoms. I could furniſh you with more Inſtances, but this may be ſufficient to ſhew, that the Wounds of the Liver are not always Mortal, as have been pronounc'd.

The Figure of the Liver is contriv'd the moſt agreeably that can be, for the Performance of the Actions, and the Uſes deſign'd it by Nature ; as alſo the moſt accommodated to the neighbouring circumambient Parts; otherwiſe, where the Parts contained are not fitted to the Parts containing, they muſt of neceſſity incommode one another in their Actions; and that this is the Contrivance of Nature, to avoid this Inconvenience, may be argu'd from the Diverſification of the Liver in ſeveral Animals, which it ſuits to the Cavity that contains it, and beſt diſpoſes it to receive the change it is to make, upon the change of Poſture in the Animals, in their ſeveral Actions and Motions.

The Subſtance of the Liver is ſoft and brittle, excepting the Veſſels and Membranes, and may be pretty eaſily waſh'd away, ſcrap'd or bruſh'd from the Veſſels that are interwoven with it.*

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* The manner of doing of which, may be ſeen in *Cowper*'s Anatomy of Human Bodies.

The Ancients judg'd it to be nothing elſe but concreted Blood; but Time and Induſtry have taught us better, and plainly diſcover'd to us, that its Parenchyma are Glands fix'd to the capillary Extremities of the Veſſels, or into which the importing Veſſels empty themſelves, and the Exporters have their Origination there, to receive the ſeveral Pieces, which by the Similitude of their Pores they are beſt able to do. It has Veſſels of all Sorts, and in great Plenty; as Veins, Arteries, Nerves, lymphatick Veſſels*, and proper excretory Ducts; to which ſome add the Gall-bladder, and conſider it only as an Expanſion of the *Meatus Cyſticus*.

It has Veins of two Sorts, and which bear two different Offices;

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* Vid. *Nuch*'s Adenographica Curioſa, and Dr. *Drake*'s Anatomy of the Liver.

for the *Vena Porta* is an importing Veſſel, and what is peculiar to this Bowel, brings Blood to it: And in this Particular, anſwers the End and Uſe of an Artery. As it enters into the Liver, it is ſtrengthened with another Coat, which by ſome is call'd *Vagina Porta*, others, *Capſula Communis*; and becauſe the *Porus Bilarius* is involv'd in it as well as the *Porta*, it is denſe and carnous, and goes along with it in all its Ramifications; and in this reſpect likewiſe it makes the Figure of an Artery. About half an Inch after its Entrance into the Liver, it forms, as it were, a *Sinus*, and there it divides it ſelf into five large Branches, which diſperſe themſelves over the whole Liver.

Thus this Veſſel, in both its Extremities, ſpreads it ſelf into an infinite Number of Branches. The Superior, as is here deſcrib'd, run thro' the Liver; the Inferior are like Roots diſtributed thro' almoſt all the Parts contain'd in the Abdomen, *viz.* Spleen, Stomach, Guts and Meſentery, where they take up the Blood, and convey it to this Trunk; where it is farther to be tranſmitted by theſe ſuperior Ramifications to the *Vena Cava*, which likewiſe has its capillary Roots diſpers'd all over the Liver, and are correſponding here to the Capillaries of the *Porta*, as Veins are to Arteries other parts of the Body.

Theſe ſeveral Ramifications make three, or ſometimes more remarkable Trunks, which likewiſe before they leave the Liver, run into one common Trunk, which preſently after its Exit, takes it Courſe through the Diaphragm, and has the Name of the aſcending Trunk of the *Vena Cava.*

The Ramifications of the *Vena Porta* running from the concave Side of the Liver upwards, and towards the Sides, as thoſe of the *Cava* taking their Courſe obliquely downwards, do frequently croſs each other: But intermix'd as they are, if you ſeparate the Membrane that inveſts the Liver from it, and ſcrape away the Subſtance or Parenchyma of it, ſo as to come to the Sight of their larger Branches, you may eaſily diſtinguiſh them from one another, by blowing into the great Trunk of either of them; for then you ſhall perceive the Wind to diſtend the Branches belonging to that Trunk you have blown into, without touching the other. But their ſeveral Branchings may be yet plainer ſhewn, by injecting Wax into their great Trunks, and which ting'd with different Colours, gives you a plain View of them. A Figure of which may be ſeen in Mr. *Cowper's* Anatomy of Human Bodies.

And here we are to take Notice of a Paſſage, which the Liver in Fœtus's has, more than in the adult, and it is call'd *Canalis Venuſus*, which ariſing from the *Sinus* of the *Porta*, carries a great part of the Blood brought by the umbilical Vein, directly in full Stream into the *Vena Cava* above the Liver, and which after the Birth for the moſt part is clos'd.

Theſe Ramifications ſhoot themſelves into Capillaries ſo extremely ſlender, that they are by no means to be diſcover'd by the Eye, or by any other help, that has been yet thought of, which has occaſion'd great Difficulties about the manner of the Blood's circulating through this Bowel.

Some maintain theſe Veſſels to be united by an *Anaſtomoſis*, and that the *Vena Cava*, viz. the Branches of this Vein are continuous to thoſe of the *Porta*; this Structure, they think, is as reaſonably to be ſuppos'd here, as it is to be demonſtrated by *Autopſy*, by the help of Microſcopes in ſeveral parts of Animals; and that Objection, that if theſe Blood-Veſſels are thus united, there can be no Separation made of the Bile, I think, may be eaſily ſatisfy'd, by conceiving that the Roots of the biliary Ducts have their Origination all along the Sides of the capillary Veſſels of thoſe Veins.

Thus the Liver then being ſuppos'd to be wholly vaſcular, its Glands are to be conſider'd as ſo many innumerable little Grape-like Circumvolutions of Veſſels, which like ſo many ſmall ty'd Bottoms of Thread wound up carefully and conveniently together, have all along in their Paſſages and Channels, an infinite Number of biliary Veſſels opening with their little Mouths into them, there to imbibe the Bile in the Circulation of the Blood, which by a Similitude of Parts, and Configuration of Pores, they are enabled by Nature to do; after the ſame manner as the *Chyle* is taken into the Lacteals from the Inteſtines.

But ſuppoſing theſe Convolutions of Veſſels to be the only Glands, and the very Texture of the Liver: And that in this long

Tract of Veſſels, there is ſufficient Opportunity given for the biliary Veſſels, which are all along affix'd to their Sides, to take in the Bile from the Blood; there will ſtill remain this Difficulty to account for, *viz.* the Taſte the Liver has. For cleanſe it as free as you can from all the circulating Humours it contains, it will ſtill be of a different Taſte from that of any other Gland, or glandulous part of the Body; which ſeems to argue it to me, to be of a different Subſtance; and ſo, that different Glands have different Subſtances: For if Glands conſiſted of Veſſels only, *viz.* Veins, Arteries, and Nerves, with their excretory Ducts; theſe Veſſels being all alike of the ſame Taſte, in all Parts of the Body; the Glands being freed from their Juices, muſt needs be ſo too, the contrary whereof is manifeſt; and ſo we muſt conclude them to be conſtituted of peculiar Subſtances different from the Veſſels, which offer themſelves with their particular Taſtes.

Therefore, I am prevail'd upon to think, that theſe Glands that make up this peculiar Subſtance of the Liver, are affix'd to the Extremities of the Ramification of the *Vena Porta*, as was before allowed, *&c.* Theſe Glands (according to the elaborate *Malpighius*) have ſix Superficies like a Die; and which he ſays are much more conſpicuous in Fiſh, and the more imperfect Animals, than in Men.

Theſe Glands hanging like Grapes upon a Bunch to the Veſſels, make as it were ſo many little Lobes, which are all cloath'd with their proper Membranes.

Theſe I take to be the Medium between the importing and exporting Veſſels; and that by the Interpoſition of theſe, the Importers transfuſe their Liquor into the Exporters. How this Separation is made, ſhall be the Conſideration of another Place.

Notwithſtanding the *Vena Porta* does the Office of an Artery, in bringing Blood to the Liver, it has an Artery of its own, which ariſes from the Cœliack; and is call'd the hepatick Artery.

In Men it is very conſiderable, and bears Proportion to the Diameter of the *Porus bilarius* ; but in Quadrupeds it is not ſo large: And the reaſon of it may be, that the *Vena Cava* being plac'd more horizontally in their Liver, it does not ſo much require the Aſſiſtance of the arterial Impulſe, directly to carry the Blood forward in its Circulation; whereas in Man, the aſcending Trunk of the *Vena Cava*, in his upright Poſture, being perpendicular, muſt of Conſequence ſtand in need of a greater Impetus to do it.*

It has Nerves from that ſuperior Plexus of the Abdomen, which *Willis* calls the Hepatick, and ariſes from ſmall Twigs of the intercoſtal Trunk of the right Side. From this Plexus a great Bundle of Fibres which take their Courſe towards the Liver, and enfolds the Artery like a Net, on purpoſe, as is thought by ſome, to give a check to the Motion of the Blood, if it ſhould chance at any time to be too impetuous.

Theſe Nerves ſupply the Liver with animal Spirits, which if they do not promote by their Mixture, the Separation that is to be made there, they at leaſt give the neceſſary Life and Vigour to the Membranes and Veſſels of it, which being thus preſerv'd in their Tone, are capable of performing their Parts, without which they could not do it; no, nor ſo much as receive any Nouriſhment.

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* Vid. Dr. *Drake*'s Anatomy.

The Liver abounds with a great Plenty of Lymphæ-Ducts, which are diſcernible enough in moſt Bodies that come under our Inſpection: But in ſome they are much more ſo, than in others.

Malpighius, deſirous to make the Liver a conglomerate Gland, and which then he thought ſhould have but one excretory Duct, could not think them to take their Original from the Subſtance of the Liver it ſelf, but from thoſe conſpicuous conglobate Glands only, which diſcover themſelves in the hollow of the Liver, under the *Capſula*, in the place where the *Porta* and *Porus bilarius* enter it; from whence taking their Courſe directly along the Meſentery, they open themſelves into the *Receptaculum Chyli.*

But the contrary, I think, may be readily made appear; and that theſe Lymphæ-Ducts have their Original from the Subſtance of the Liver all over it: No Part which receives Nouriſhment, can be without them; which, I preſume, will not be deny'd of the Liver.

To make this more plain, let us conſider the Method Nature follows in the Diſtribution of the Nouriſhment of our Bodies; for which great End the Circulation of the Blood ſeems principally to have been inſtituted; for by this Means the nutritious Parts, together with the reſt of the circulating Maſs, are carry'd to all the parts of our Body.

The ſerous Part of theſe circulating Humours, is the greateſt part of them; and in reſpect to the nutritious Parts of the Blood is their Vehicle, and keeps them ſufficiently diluted for their Conveyance to the reſpective Parts; which when it has there firſt for their Nouriſhment, it returns again to the Blood by the Lymphaticks.

Thus the lymph or ſerous Part of the Blood, to digreſs a little, is of great Conſideration; and obtains various Uſes, according to the variety of the Glands in the Body, where it is ſeparated.

That Separation made of it by the Glands of the Mouth, Stomach, Inteſtines, and Pancreas, ſerve to macerate, digeſt, and diſſolve our Food, and to extract as it were the nutritious, gelatinous parts of the Aliments, with which by their Vehicle, they are taken into the Lacteals by that way to be convey'd to the Blood, and ſo to all parts of the Body, and conſequently to the Liver ; which when they are diſpos'd by the Lymph for its Nouriſhment, being thus depauperated, return again to the Blood, and is received in all parts of the Body by proper Veſſels, call'd *Lymphatick*, there to receive new Impreſſions.

This being granted, we may ſafely conclude, that no parts of the Body that receive Nouriſhment, can be without them ; and conſequently the Liver throughout its Subſtance muſt have them. But to ſuppoſe this Separation is to be made by conglobate Glands alone, is not ſo neceſſary, as the late worthy Author ſeems to hint. For theſe Lymphaticks that return their Lymph to the Blood from the Limbs, do not diſcover to have their Origin from any near the Glands; and I think it not difficult to conceive, how the thinner Parts of this Fluid may drain away from thoſe thicker nutritious Parts, which it has left fix'd in the Pores of the Parts for their Nouriſhment, and be taken in at the Roots of theſe Lymphæ-Ducts, which afterwards running into larger Branches, and make thoſe Trunks which are conſpicuous on the Surface of the Liver.

I muſt confeſs, the extreme Capillaries of theſe Veſſels, are not to be prov'd by *Autopſy*, no more than thoſe of the Veins and Arteries are: But if we compare theſe conſpicuous lymphatic Veſſels, with Blood-Veſſels of the ſame ſize, and conſider the Number of Capillaries that muſt meet together, before they conſtitute Trunks of that bigneſs; we may be eaſily led into a Notion, that the Capillaries of theſe Lymphaticks likewiſe are ſufficient in Number to have overſpread the whole Subſtance of the Liver, or rather from their Number that they muſt have done ſo, to be able to have conſtituted Veſſels of that ſize.

The Gall-bladder is a membranous Veſſel or a Cavity of the ſhape of a Pear, and is ſituated in the hollow Side of the Liver, on the right Side, and under the thickeſt part of it; where it forms it ſelf a Cavity to lodge in. That Part which hangs without the Liver, reſts upon the right Side of the Stomach, and Colon, which it often dyes of a yellow Colour.

It is divided into its Fundus or Bottom, and Cervix or Neck. The Neck is much the narrower part, and is wrinkled in its inſide to hinder the too haſty deſcent of the Bile.

The Bottom is larger and wider, and is that part which contains the Bile, and which it generally tinctures with its Colour.

As to its Bulk, it is very ſeldom the ſame in different Subjects. Its Bottom, extended with Bile in Figure and Bulk, pretty much reſembles a ſmall Hen's Egg, which contracting it ſelf into a narrow Neck, is continu'd to the *Meatus Cyſticus*. But neither is the Figure the ſame in all Bodies; for in ſome it is longer and narrower, and in others ſhorter and broader.

It is fix'd to the Liver both by Veſſels and Membranes, *viz.* by the common Membrane, and by a Proceſs of the *Capſula* that involves the *Porus bilarius*, and *Porta*.

Beſides theſe Membranes, ſome Anatomiſts will have the Gall-bladder to conſiſt of three proper Coats.

The firſt and outmoſt which they call the vaſcular one; the ſecond is muſcular, which they deſcribe to conſiſt of two Orders of Fibres: The third, which is the inmoſt, they look upon to be nervous, after the Texture of the Stomach. But whatever might lead theſe Inquirers into this Miſtake, I preſume it may be made appear, that its Texture is not according to their Deſcription, by ocular Demonſtration; for upon Examination of it by a Microſcope, we find it to be compos'd of two Membranes only;

with a ſpongy veſicular Subſtance between them. Theſe Membranes, like two Walls, protect this middle Subſtance contain'd within them, and which conſiſts of an infinite Number of Ramifications of Veſſels, running along the length of the Gall-bladder, and as it were between Membranes lamellated, as I had an Opportunity of diſcovering with a Microſcope, in a piece of the Gall-bladder dry'd, which before had been blown up with Wind.

Theſe Veſſels, without Diſpute, terminate into thoſe Glands that ſerve for the Separation of the mucous into that Viſcus which is to defend the inward Membrane againſt the Acrimony of the Bile.

This then being the Structure of the Gall-bladder, it is plain, that it is paſſive in its Evacuations, and that they principally depend upon the Preſſure of the neighbouring Parts.

The Gall-bladder has belonging to it, Veins, Arteries, Nerves, and Lymphæ-Ducts, and Gall-Ducts. The Veins empty themſelves into the *Porta*. There are two of them, and are therefore call'd *Cyſticæ Gemellæ*. The Arteries and Nerves it has from the hepatick Veſſels.

As the Veins make their Exit, the Arteries and Nerves enter into the Bladder about its Neck, which from thence running along towards the bottom, become more and more divided, ſending plentifully every where Branches all along the Circumference of the Bladder.

The Lymphæ-Ducts run along from the bottom of the Bladder to the Neck, where they join into one Trunk.

The Gall-Veſſels belonging to it, are of two Sorts, *viz.* ſuch as bring the Bile to it, and ſuch as carry it away.

The Veſſels of the firſt kind have their Original from the Liver; ſome of which probably come directly to the Bladder from the reſpective Glands, whilſt others, as may be prov'd, open into the Hepatick-Duct.

Gliſſon has long ago taken Notice of a very remarkable Gall-Duct, which enters into the *Veſicula Fellis* at its Neck, by that part where it abounds with Wrinkles. This Trunk, ſays he, tho' it be ſmall, and ſcarce by a hundredth part ſo big as the *Porus bilarius*; yet it diſtributes its Branches and capillary Roots, thro' the Parenchyma of the Liver, and ſeems to have a Branch of the *Porta* accompanying it, as well as the *Porus bilarius* has; which it is hard to diſtinguiſh it from, any otherwiſe than that it takes its Courſe towards the Gall-bladder.

He farther adds, that it is difficult to find its Inſertion here, as is that of the *Ureters* into the urinary Bladder; but may be ſuppos'd to be of that ſpongy Protuberance, which is to be diſcover'd near the *Meatus Cyſticus*; and which he thinks does the Office of a Valve, and hinders the return of the Bile.

This worthy Author farther owns, that he has diſcover'd two of them ſometimes; but this he thinks to be only *Luſus Naturæ*.

In this *Viſcus* are ſeveral Ducts that open themſelves both into the *Veſicula Fellis* near its Neck, and alſo into the *Meatus Cyſticus*.

This I have plainly ſeen in an Ox's Gall-bladder, by tying the *Meatus Cyſticus* near to that part, where it unites it ſelf to the *Porus bilarius*, ſo cloſe, that no Wind can paſs that way; for then by blowing into the Hepatick-Duct, you ſhall preſently ſee the Bladder inflated. And farther, if you lay open, with your Inciſion-Knife, the Bladder, together with the *Meatus Cyſticus*, to the Ligature, you ſhall find upon blowing, the Wind to vent it ſelf by ſeveral Mouths, both into the *Veſicula Fellis*, and the *Meatus Cyſticus*; and which plainly proves, as was before taken Notice of, a Communication between the *Ductus Hepaticus*, and thoſe of the *Veſicula Fellis*.

Theſe Ducts are ſo very ſlender, that I have not been able my ſelf, or ever heard any that were to inject them with Wax, or any other thing that would more plainly diſcover them to us; but I think, from the foregoing Experiment, their Exiſtence is clearly evinc'd; and which then may be ſuppos'd to receive Bile by their capillary Roots, as thoſe of the *Porus bilarius* do, in order to convey them to the *Veſicula Fellis*, there to be repoſited for the Purpoſes of the Animal Œconomy, according to the Inſtitution of Nature.

From their Office, there has been the Denomination of Hepatick-cyſtick-Ducts given them. The Ducts that carry away the Bile both from the Gall-bladder and Liver, ſhall be given there, and are call'd the Hepatick-Duct, and the *Meatus Cyſticus*, and the *Ductus Communis Choledochus*.

The Hepatick-Duct ariſes from the Liver in ſeveral Branches or Roots, where taking its Courſe without the Liver, it meets with another Duct, which is that now mention'd, and is call'd the *Meatus Cyſticus*, which coming from the Gall-bladder, about two Inches (the ſame diſtance that the Hepatick-Duct is from the Liver) it is join'd to it ; where from the Office it bears, both in reſpect to the Liver and Gall-bladder, it takes another Name, and is call'd the *Ductus Communis Choledochus*, or common Duct ; which is the third Duct mention'd, and is farther carry'd to the *Duodenum*, or *Jejunum*, where it is inſerted obliquely into one of theſe Inteſtines about four or five Fingers breadth from the *Pylorus* at the ſame place, where the Pancreatick-Duct opens it ſelf into the Inteſtines oftentimes.

times. By this oblique Inſertion, and by the ſpongy Protuberance of its Mouth, which ſeems to have the uſe of a Sphincter-Muſcle, the Regurgitation of the Bile to the Liver is prevented.

The Hepatick-Duct, and the *Vena Porta* run along together thro' the whole Liver, and being inveſted with one common Coat, the larger Branches of it with the larger of the *Porta*, as the ſmaller with thoſe of the ſmaller, they ſeem as if they were but one Veſſel; yet upon Examination, they are eaſily diſtinguiſhable: For the biliary Ducts are, all along in their Ramifications, much leſs than thoſe of the *Porta*, and are likewiſe ting'd with Yellow from the Bile which they carry; and are to be ſeen by blowing into the *Porus bilarius*, and ſtill plainer, without any Diſpute, to be ſhewn, by injecting Wax into them, as is here to be ſeen.

We meet with Stones frequently in the Bladder, which are much lighter, and more ſpongy than thoſe of the urinary Bladder, and will ſwim above Water; which ſometimes lying in the Neck of the Gall-bladder, obſtruct the Hepatick Ducts opening into it, and by that means prevent the import of Bile into it, and cauſes an incurable *Jaundice*. In which Caſes it has been obſerv'd, that the Bladder has been full of a Liquor, that has not had the leaſt Taſte of Bile, and which we may reaſonably think to have been the Matter ſeparated by the Glands of the *Veſicula* before ſpoken of.

Having deſcrib'd the Liver at large, with the Veſſels belonging to it. The next thing that offers it ſelf to our Conſideration, is its Office and Function, which is evidently the Separation of the Bile from the Blood. But how this Bile is ſeparated, is a Difficulty worth our inquiring into. To ſolve this, ſome have imagin'd it to be done by the help of Fermentation; whilſt others think it may be brought to paſs Mechanically, without the Aſſiſtance of any Ferment, purely by the impelling, progreſſive, and inteſtine Motion of the Blood; where the Glands of the Liver, with their importing and exporting Veſſels opening into them, like Sieves or Filters, give Paſſage only to its bilious Parts, according to the Configuration of their Pores, and the Conformity of the *Moleculas* of the Bile that is to paſs thro' them.

They that cannot look upon theſe Glands to be merely Paſſive, but that they contain ſomething of a fermentative Nature in them, by which the circulating Humours, as they run thro' them, are ſo alter'd, as to become better diſpos'd for quitting its bilious Parts; are mov'd to it from a Conſideration of the cloſe Union by which thoſe bilious Parts adhere to thoſe of the Blood in the *Porta*; which is not by ſimple Contact only, and ſo eaſily ſeparable, as Bodies ſlightly mix'd are.

This they think to be apparent from the Taſte of the Blood in the *Porta*, which has not the leaſt of that of Bile in it; and which after Separation, will, if remix'd to that or a greater Quantity, tho' but a few Drops, ſenſibly communicate its Taſte to it. This, as it argues a ſuperficial

Mixture only here, ſo it proves a cloſe Union of it with the reſt of the circulating Humours in the *Porta*, where by it is as it were loſt.

This they enforce, by urging, that the Blood has longer time to make its Circulation in, thro' the Liver, than in other Parts; it being not ſo much accelerated by the direct rapid Motion of the arterial Blood in its full Force, as it is in the Kidneys, and other Organs of Separation, and conſequently more ſubject to Obſtructions, from whence proceeds moſt commonly a *Jaundice*; for the Arteries are few, in reſpect to the importing Veins. This Circulation they look upon to be a great Contrivance in Nature, to give ſufficient Time and Opportunity for the Ferment to operate in, and deſtroy this cloſe Connection.

But however plauſible this Opinion may ſeem, and that Fermentations are able to bring theſe and greater Changes in the Blood; and that the ſlender Capillaries of the Veſſels and Glands are ſuitable and proper Places for this Ferment to perform its Operation in, as the ſlower Progreſs of the Blood in them gives Time: Yet it will ſtill remain as difficult to account for, how the Liver came by this Ferment. And either it muſt make it it ſelf, or be ſerv'd with it elſewhere. This laſt, way I know not, that it is offer'd at by any, there being not the leaſt Diſcovery made of any ſuch importing Veſſels as might convey it thither.

That the Liver ſerves it ſelf with this Ferment, is not more probable. For beſides, that the Difficulty would be no leſs to ſhew how even that was made here; it is plain, that there is no ſuch peculiar Juice to be met with; no Organs for the Separation of any ſuch Liquor (the Bile excepted, which is the Matter in Queſtion how it is ſeparated) are to be ſeen. And farther, the Taſte of the glandulous Subſtance of the Liver, which is not at all diſagreeable, if cleans'd from the Liquor in the excretory Ducts, *viz.* the Bile it ſelf, ſhews there is nothing of that kind contain'd in them.

On the other ſide, they that endeavour to explain this Separation mechanically, and who ſuppoſe the Aſſiſtance of a Ferment not neceſſary, ſeem not to labour under ſuch a Neceſſity of ſuppoſing Improbabilities. Nay, the Mechaniſm of this Bowel, ſeems extremely to encourage us to this Explication. Here is the *Vena Porta* branching it ſelf into very ſlender Capillaries; a parenrenchymatous Subſtance, or Fibre-like Texture of the Liver. Here are Mouths of exporting Ducts opening into them, of different Pores, to receive their Liquors proportion'd to them. And here is the circular and inteſtine Motion of the Blood, with a farther *Vis Motiva* of that of the Compreſſion of the Abdomen in Inſpiration, before taken Notice of, to drive theſe different Juices into their proper Pores. And hence it is that Emeticks are ſo ſerviceable in a *Jaundice.*

To prepare you with our Notion of it, it may not be amiſs to take here into our Conſideration, the Fluidity of Liquors, which ſeem to conſiſt in the actual Diviſion of the Parts of the Fluid; which taken by themſelves, are no more, than ſmall, hard, and figur'd *Moleculas*; and which being join'd in a Body, are only contiguous to one another; but being of ſuitable Superficies, are ſo free and fit for Motion, that they are perpetually changing Places, as we ſee from the ready Mixture of many Things put to them.

The different Conſiſtence, Structure, Configuration, and Motion of theſe *Moleculas* that compound the particular Fluid, conſtitute their different Natures and Properties. Thus the *Moleculas* that make up the Body of Matter, are Homogeneous, and like to themſelves, yet very different from thoſe of Oil.

Now, if at any time two Fluids of a different Nature are mix'd together; and their Parts are ſo accommodated, as but barely to touch one another, the Mixture which ariſes from them, may very well be compar'd to that of ſolid Bodies being jumbled and mix'd together; and which becauſe we ſee may be eaſily ſeparated again by ſifting, ſo may mix'd Liquors by Filtration; which may reaſonably be thought to be brought to paſs much after the ſame way, *viz.* by the Structure of the Fibres, as the Separation of the hard Bodies were by that of the Sieve; whereby the Figures of the *Moleculas* of the Fluid are ſo adapted to the Figure of the Pores, thro' which they are to paſs, that they can receive ſuch alone; and all others, as not able to enter, muſt be excluded.

This Mechaniſm may be eaſily conceiv'd to diſpoſe of the Parts of Fluids, ſo looſely join'd, after that manner: But when the *Moleculas* conſtituting a Fluid are heterogeneous, yet conſiſt of Parts ſo cloſely united, that, in reſpect of their Superficies, they are homogeneous, there ſeems to be ſomething forcible and violent; ſuch as ſome Ferment or other to break this cloſe Texture. This then lies upon us to ſhew, that the Liver, by its Structure, is able to effect this Change in the united heterogeneous Parts in the Blood, without any Fermentation.

To make this the more obvious, we are to conſider the mechanical Progreſs that Ferments make in diſſolving the Bodies they are mix'd with. And they are, I think, acknowledg'd on all Hands to effect it, by inſinuating themſelves into the Pores of the Parts of the mix'd Body; where they, like Wedges, being farther driven by ſome impelling Cauſes, do cleave and tear to pieces the Parts they have inſinuated themſelves

ſelves into ; and after that manner, intirely deſtroy their Union. But a larger Time and Space is always thought neceſſary for Ferments to act their Parts in ; than the Time of the Circulation of the Blood thro' the Liver, and the very ſlender Capillaries of the Blood-Veſſels will allow of, as was before obſerv'd. On the other Side, if the Blood, with the Bile, tho' in ſtrict Union, without any ſuch additional Ferment, be driven with ſufficient Force into the Subſtance of theſe Sieve-like Glands ; where the Mouths of the exporting Veſſels likewiſe have their Originations ; and which, in a ſound State, are eaſily ſuppos'd not to give way, or alter in the Configuration of their Pores, its Texture may be broken into, for the Mouths of the different Exporters to receive the Parts ſuitable to them. Nay, farther, can it not be apprehended, that this impulſive Force, by which the Blood is driven thro' the Liver, is ſufficient to force the proper Parts into the Mouths of the ſeveral Exporters, and where in a manner like melted Metals, they are oblig'd to take the Form of the Mould they are caſt in; ſo that as Ferments, by their Wedge-like Action inſinuating themſelves into the Pores of the *Moleculas*, and heterogeneous Parts of a mix'd Body do deſtroy their Union; ſo here, theſe *Moleculas* being driven thro' the ſtrait Pores of the Part, are broken to pieces, and forc'd into the Shape ſuitable to the Parts they are to paſs thro'.

To encourage us in this Hypotheſis, Nature ſeems very ſollicitous in proportioning the Motion of the Blood thro' the Liver, to the Taſk it is to perform there. And for this Purpoſe there ſeem to be in ſeveral Subjects ſeveral Contrivances. In Man, who walks upright, Nature has ſupply'd him with an Hepatick-Artery much larger than in Animals, whoſe Poſition is more horizontal; as in Horſes, tho' their Liver be much larger; as if the exact proportioning of this Motion was a Matter of the greateſt Conſequence; for if it be carry'd too forcibly or rapidly thro' the Liver, there might not be allow'd ſufficient Time for the Action, or it might offer Violence to the Parts thro' which it was to be driven.*

If this Force ſhould be weaker than ordinary, it may not be of ſufficient Vigour to break the Connection of the Blood, by driving it into theſe narrow Pores of the Parts, where it is as it were to be modify'd anew, and to whom they owe their preſent Form, Configuration of Parts, and Structure.

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* Vid. Dr. *Drake's* Anatomy of the Liver.

For this Reaſon Man ſeems to be ſupply'd, as was ſaid before, with an Artery larger than in other Animals, to quicken the Motion. As for the firſt Reaſon, the Blood, to break its Force, takes its Circuit thro' the Spleen; for whatever over Alterations have been imagin'd to have been made in the Blood by its paſſing thro' the Spleen, theſe only at preſent are prov'd, *viz.* that the Force of the Blood is broke, which by the *Porta* is to go from thence to the Liver. And ſecondly, that there is a Separation of Lymph made here, as appears by the

Lymphæ-Ducts, (with which this Bowel pretty much abounds*) and which poſſibly, by taking ſomewhat from its Fluidity, may be a farther Bridle to its Motion.

That Anatomiſts ſhould impute thoſe Coagulations they have obſerv'd in the Bile of Bodies, that have not their Spleen taken out, to its Extirpation, I ſee no certain Reaſon; they may be Accidents and Effects owing to no ſuch Cauſes. But if it muſt be ſo, it is as free for me to ſuppoſe, that it is for want of Lymph to keep the Bile diluted; for tho' the Blood loſes ſome of its Lymph in the Spleen, yet it does not do it proportionably to what it does in the other Parts that feed the Liver with Blood by the *Porta*.

The Bile being thus ſeparated in the Liver, and carry'd partly to the *Porus bilarius*, and partly to the Gall-bladder by proper biliary Ducts diſpers'd thro' its Subſtance, are by them to be convey'd to the Inteſtines; where our next Inquiry will be about the Uſe it bears in the Animal Œconomy, which is, in my Opinion, for the Subtiliſation and Attenuation of the *Chyle*, or diſſolv'd Maſs of Aliments ſent down to the Inteſtines from the Stomach.

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* Vid. Mr. *Cowper's* Anatomy, and *Nuch's* Adenographica.

To this Purpoſe there ſeems to be one part of the Bile carry'd to the Gall-bladder, which is to be preſerv'd againſt thoſe occaſional Times, and where by its ſtay it contracts likewiſe a greater Acrimony, and becomes a more powerful Diſſolvent.

In theſe periodical Evacuations of the Bile, I cannot conceive the Gall-bladder to be any thing concern'd in ſending it to the Inteſtines; there being no muſcular Coat here to aſſiſt it, and promote its Contraction, as we have before obſerv'd.

The Bile then being thus preſs'd into the Inteſtines, it there mixes with the *Chyle*. I think it is wholly owing to the Preſſure of the adjacent Parts, which is particularly promoted by Inſpiration, and in the times the Stomach is diſtended with Aliments, and which in the Diſtribution of them to the Inteſtines, ſqueezes the Gall-Duct from this Bladder. From hence the uſe of Vomits in a *Jaundice* may be accounted for; where by Virtue of its penetrating lixivial Salt, it farther diſſolves the Aliments, which being ſtill more ſubtiliz'd, and as it were, alcaliz'd, gives a greater Opportunity for the Lymph of the Stomach and Inteſtines to enrich themſelves with their nutritious Parts; with which being impregnated, it may eaſily be conceiv'd to be taken in at the Mouths of the Lacteals without any ſuppos'd Fermentations or Precipitations. The thinner and more profitable Parts of the Aliments being thus taken by the Lacteals; the thicker, which were uncapable of entring their Mouths, are diſpatch'd away by the Inteſtines, and which by their periſtaltick Motion are as ſerviceable in forcing the *Chyle* into the Lacteals, as the Fæces downwards.

In promoting this Motion of theirs, the Bile ſeems not ſo much concern'd, as has been imagin'd. For beſides, that it is not probable, that thus diluted with the *Chyle*, it ſhould be of that irritative Nature to provoke the Inteſtines, which when ſincere and unmix'd in a ſound State, gives no Diſturbance at all to the Coats of its *Cyſtis*; which appears to be as ſenſible as thoſe of the Intetines; and we ſee in cœliack Paſſions, where there are plenty of Stools, by the colour of the Fæces, that the Bile has little to do with them. But Dejections are chylous, and appear to proceed from a want of Bile to attenuate the *Chyle*, and make it fit to be receiv'd by the Lacteals; as may be conjectur'd from the Method of Cure where Practice directsus, as in Caſes of Obſtructions ſuch Medicines as attenuate. *Borellus*, from a Conſideration of what Blood paſs'd thro' the Liver in every Circulation, which by the Proportion of the Diameter of the Blood-Veſſels, he thinks to be about a twenty-fifth Part; as alſo from the Proportion that the Bile bears to the reſt of the circulating Humours,

mours, which he judges to be about a tenth Part; and likewiſe contains the Quantity of Bile, which in every Circulation of the Blood thro' the Liver, muſt needs be ſeparated there, in as much as theſe bilious Ducts are free and open, as thoſe of the exporting Veins are; that therefore they will carry in them their full Quantity of Bile proportionably to their Diameter, which, in the compaſs of a Day, will be in Quantity ſixteen times more than is contain'd in the whole Body, the Bile being made from *Chyle* only, according to him. He concludes, that there muſt be a Neceſſity of Circulation of it; and that the Bile is taken up from the Inteſtines by the Meſeraick Veins, and there with the Blood remanded to the Liver.

But, with the Leave of this great Author, it muſt be ſaid, that whatever Neceſſity there is for ſuppoſing a Circulation of the Bile, it cannot be return'd this way to the Blood; becauſe it is evidenc'd by Anatomy, that nothing is convey'd to the Blood from the Inteſtines, but by the Lacteal-Veſſels alone.

And ſecondly, that no Liquor does enter the Lacteals in a natural State in the form of Bile, as appears by the Taſte of the *Chyle*. And thirdly, that no Lacteals leave any nearer Paſſage to the Liver, than by the Heart.

But farther, he uſes no convincing Argument to perſuade us that the Bile is not made from the Blood. The Inſtance, I am ſure, he gives of Serpents, whoſe Gall-bladder, and *Porus biliarus* will be as turgid with Bile, after ſeveral Months faſting, as at any other time, argues to me, as if the Matter of Bile was in the red part of the Blood. And that it is not without Grounds, what has been aſſerted, that the Bile and red grumous part of the Blood do differ in nothing but a greater or leſs Attrition and Attenuation, which repeated Circulations will bring about.

Thus we ſee in hot Conſtitutions, where there are high Pulſes, and briſker Circulations, the Conſtitutions are likewiſe more bilious, and the Perſons that have them are more incident to Diſtempers of the Bile. But to purſue this Inſtance farther; if Bile can be allow'd to be made of *Chyle* only, or ſome Parts of the Aliments freſh taken, there certainly would have been, for want of Food after ſo many repeated Circulations, a Scarcity of Bile; which was not the Caſe here, after ſo many Months faſting. For, according to this great Author, a ſmall part of the Bile is carry'd down with the Fæces in every Circulation, which leſſens its Store dy degrees; the contrary whereof is here experienc'd.

I might farther deny, (for he has not prov'd it) that the bilious Ducts are always employ'd in their full diſtended Capacities. They may indeed be ſo, when there is Bile enough to fill them. But this does not prove a Neceſſity of their always being ſo; but they are ſo contriv'd, that be the Quantity of the ſeparated Liquors more or leſs, they are ſufficient to convey away what is deliver'd to them by the Glands.

But ſtill, in one Senſe, it may with Safety be affirm'd, that a great part of the bilious Maſs returns again to the Blood ; and that by the Lacteals too : For as by the Analyſis of the Bile we are inform'd, that it conſiſts of a great deal of Water, a little Oil, and a little Salt ; this Water, which is the lymph or ſerous part of the Blood, and which indeed is the greateſt part of it, and of very great Importance, in conſideration that it is a Vehicle for the Parts it diſſolves, as was before obſerv'd ſpeaking of *Chylification*.

This Lymph then, we may affirm, does the ſame kind Office to thoſe parts of the Blood, with which being join'd, it has the Denomination of Bile ; which it keeps ſufficiently diluted, becomes their Vehicle, and being well mix'd, gives them Conveyance to the Inteſtines ; where being mix'd with the Contents there for the Purpoſe abovemention'd, ſuch Parts of it as are fit to paſs thro' the Colatures of the Lacteals are ſuck'd up, in order to be return'd to the Blood. But as was before obſerv'd, not one drop of it under the form of Bile, in a ſound State at leaſt.

The Bile, as it offends either in Quantity or Quality, oftentimes brings very great Diſorders upon us.

For as in our natural State, when the Blood abounds with bilious Particles, yet not to that degree, ſo as to interrupt the Regularity of our Actions in the Animal Œconomy, which would be to make a Diſeaſe; but gives that ſort of Conſtitution, that the Ancients call'd hot liver'd: We find by Obſervation, that our Bodies are always liable to hot

Diſeaſes; ſuch as Fevers, &c. and on the other ſide, where theſe active Parts are not ſo abounding, they are diſpos'd to cold Diſeaſes, ſuch as Obſtructions, Cachexies, &c. ſo in a preternatural State, how the Alterations are produc'd, may be eaſily accounted for; the too great Quantity of it making the Blood more fluid and ſpirituous, as the want of it is more viſcid in conſiſtence, and leſs active.

That the Bile offends in Quality, may be granted, I preſume, from the Alteration of the Colour, which is made in its preternatural State. Its natural Colour is Yellow; but in a morbid State it will turn from that to a deeper Yellow, and ſo from a lighter to a deeper Green, ſo to a black Colour; as may be ſeen by the Experiment of mix-ing Acids with it; which they likewiſe coagulate (and as hath been ſeen) into a Subſtance not extremely unlike to Stones taken out of the Gall-bladder. The Affuſion of Spirits of Hart's-horn, will redeem it from its Coagulations, when it is lightly ſo. But whether any Liquor in the Form and full Force of Acids can get to the Bile in the Liver, I think may be fairly queſtion'd: But it is certain, it may meet them in the Inteſtines and Stomach, where (according to the degree of the Fermentation they make with it) they may produce either Flatulences, Vomiting, the Cholera Morbus, Diarrhæa and Dyſenteries, according to the Parts affected, and where theſe heterogeneous Liquors meet.

From the Effervescence made by the Bile with the other vitiated Humours, Flatulences frequently enſue, which will very well account for a great Number of the Symptoms of hyſterick and hypochondriack Perſons; as we ſee hyſterick Colicks oftentimes terminate in the *Jaundice.*

From this Fermentation of the Bile, with the vitiated Humours it meets with in the *Primæ Viæ*, the firſt Symptoms of Fevers may be very well explain'd, and alſo ſeveral of the conſequent ones, as is own'd by Practitioners; and it may be from the Speculation of the periodic Evacuations of the Bile in the Gall-bladder, the Doctrine of intermitting Fevers may be better eſtabliſh'd, than it hitherto ſeems to have been. But to proſecute this as it ſhould be, requires a longer time than is reaſonable for me to take now;

therefore, I ſhall conclude, and leave theſe Hints only to your farther Conſideration.

FINIS.